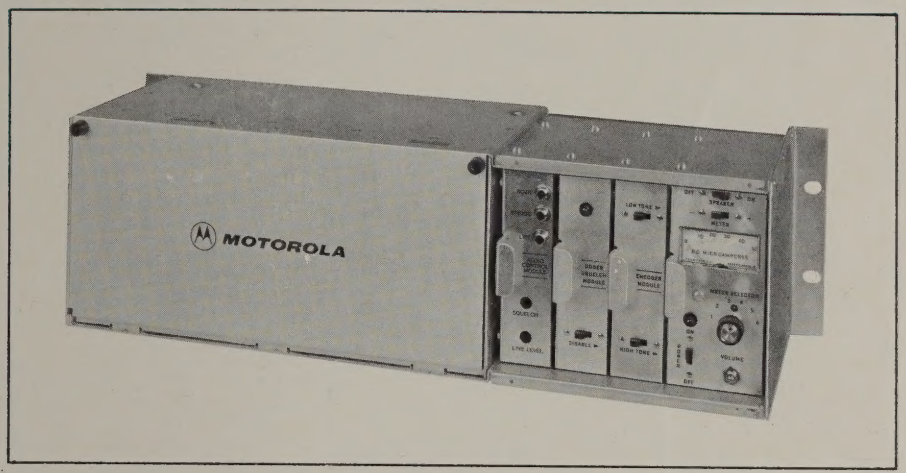
MOTOROLA

SPECTRA TAC™
Total Area Coverage
Voting and Satellite Receivers



Instruction Manual

68P81039E45-A

COMMERCIAL WARRANTY
(STANDARD)

Motorola radio communications products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, (except for crystals and channel elements which are warranted for a period of ten (10) years) from the date of shipment. Parts, including crystals and channel elements, will be replaced free of charge for the full warranty period but the labor to replace defective parts will only be provided for One Hundred-Twenty (120) days from the date of shipment. Thereafter purchaser must pay for the labor involved in repairing the product or replacing the parts at the prevailing rates together with any transportation charges to or from the place where warranty service is provided. This express warranty is extended by Motorola Communications and Electronics, Inc., 1301 E. Algonquin Road, Schaumburg, Illinois 60196, to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED WHICH ARE SPECIFICALLY EXCLUDED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW.

In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown, Motorola, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Motorola shall be the full extent of Motorola's liability hereunder.

This warranty is void if:

a. the product is used in other than its normal and customary manner;
b. the product has been subject to misuse, accident, neglect or damage;
c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

This warranty extends only to individual products, batteries are excluded, but carry their own separate limited warranty. Because each radio system is unique, Motorola disclaims liability for range, coverage, or operation of the system as a whole under this warranty except by a separate written agreement signed by an officer of Motorola.

Non-Motorola manufactured products are excluded from this warranty, but subject to the warranty provided by their manufacturers, a copy of which will be supplied to you on specific written request.

In order to obtain performance of this warranty, purchaser must contact its Motorola salesperson or Motorola at the address first above shown, attention Quality Assurance Department.

This warranty applies only within the United States.

EPS-27734-O

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EPS-34440-B

68P81112E94-B

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instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUALS AFFECTED:

68P81002E96	Model TLN1181A Single Tone Decoder Module
68P81013E60	MICOR COMPA-STATION Base and Repeater Radio 25-50 MHz, 100 W
68P81013E65	MICOR COMPA-STATION Base Radio Remote Control 132-174 MHz
68P81013E70	MICOR COMPA-STATION Base Radio 25-50 MHz Local Control
68P81013E75	MICOR COMPA-STATION Base Radio 132-174 MHz Local Control
68P81015E33	Model TLN4662A Squelch Gate Module
68P81016E15	MICOR COMPA-STATION Base Radio with Digital Decoder DC Remote Control 132-174 MHz
68P81016E19	Model TLN4638A F1 and F1-PL Tone Decoder Modules
68P81017E25	MICOR COMPA-STATION Base & Repeater Station 72-76 MHz, 30 W
68P81017E85	MICOR COMPA-STATION Base Radio Tone Remote Control with Digital Decoder 132-174 MHz
68P81018E14	Model TLN1467A Multifunction Digital Decoder
68P81018E26	MICOR Base Station Accessories, Metering and Intercom, Opt C149
68P81019E75	MICOR Upright Base and Repeater (RT) Station 132-174 MHz
68P81020E40	MICOR Base Station 4-Frequency, Tone Remote Control
68P81022E90	MICOR Upright Base and Repeater (RT) Station, 136-174 MHz, 250 & 375 W

68P81022E95	MICOR Upright Base and Repeater (RT) Station, 25-50 MHz, 300 Watts RF
68P81025E50	MICOR Base and Repeater Stations, 406-420 MHz, 450-470 MHz, 470-512 MHz
68P81025E55	MICOR Community Repeater, 406-420 and 450-512 MHz
68P81025E60	MICOR Base and Repeater Stations, Control and Application
68P81026E28	Model TRN6085A SPECTRA-TAC Encoder Module
68P81031E45	MICOR Base and Repeater Station, 851-866 MHz Tx, 806-812 MHz, Rx
68P81031E95	MICOR Community Repeater, 851-866 MHz Tx, 806-821 MHz Rx
68P81032E25	MICOR Super CONSOLETTE Control Station, 806-866 MHz
68P81033E10	PULSAR IMTS Base Stations, 450-512 MHz
68P81033E15	PULSAR IMTS Base Stations, 150.8-160 MHz
68P81033E20	PULSAR Tone Remote Adapter for IMTS Base Stations
68P81033E25	PULSAR Tone Remote Control Interface Unit
68P81036E36	Model TRN6085B SPECTRA TAC Encoder Module
68P81039E45	SPECTRA TAC Total Area Coverage, Voting and Satellite Receivers
68P81039E50	SPECTRA TAC Total Area Coverage, Comparator
68P81039E55	MICOR Base and Repeater Stations, 406-420 MHz, 450-470 MHz, 470-512 MHz
68P81105E20	Option C226 Service Intercom
68P81106E30	MICOR Base Station Accessories, Multiple Tone PL Options
68P81107E40	Option C269 SPECTRA TAC Encoder

ITEMS AFFECTED:

The following items (listed in the instruction manuals previously listed) are affected by the resistor part number changes that are listed under REVISION DETAILS.

TLN4044A	TLN5122A	TLN5946A	TRN6297A
TLN4048A	TLN5167A	TLN5948B	TRN6326A
TLN4054A	TLN5292A	TLN5955A	TRN6413A
TLN4635B	TLN5294A	TLN5956A	TRN6552A
TLN4636A	TLN5458A	TLN8773A	TRN6566A
TLN4637A	TLN5744A	TRN6002A	TRN6568A
TLN4638A	TLN5779A	TRN6006A	TRN6689A
TLN4658A	TLN5804A	TRN6007A	TRN6717A
TLN4659A	TLN5924B	TRN6080B	TRN6752A
TLN4660A	TLN5925A	TRN6083A	TRN6956A
TLN4661A	TLN5926A	TRN6085B	TRN8095A
TLN4662A	TLN5927A	TRN6087A	TRN8406A
TLN4663A	TLN5932A	TRN6091B	TRN8676A
TLN4664A	TLN5934A	TRN6093A	TRN8684B
TLN4665A	TLN5938A	TRN6095A	TRN8787A
TLN4667A	TLN5939A	TRN6097A	
TLN4668B	TLN5940B	TRN6100A	
TLN4669B	TLN5941A	TRN6101A	
TLN4670B	TLN5943A	TRN6165A	
TLN4852A	TLN5944A	TRN6166A	

REVISION DETAILS:

All 1/4 watt, carbon composition, fixed resistors used in the previously listed items are replaced with ±5%; 1/4 watt, carbon film, fixed resistors. Use the following cross-reference list to update the parts lists in your manual.

OHMS (±5%; 1/4 W)	NEW PART NO. (carbon film)	OHMS (±5%; 1/4 W)	NEW PART NO. (carbon film)	OHMS (±5%; 1/4 W)	NEW PART NO. (carbon film)
10	6-11009C01	470	6-11009C41	22k	6-11009C81
11	6-11009C02	510	6-11009C42	24k	6-11009C82
12	6-11009C03	560	6-11009C43	27k	6-11009C83
13	6-11009C04	620	6-11009C44	30k	6-11009C84
15	6-11009C05	680	6-11009C45	33k	6-11009C85
16	6-11009C06	750	6-11009C46	36k	6-11009C86
18	6-11009C07	820	6-11009C47	39k	6-11009C87
20	6-11009C08	910	6-11009C48	43k	6-11009C88
22	6-11009C09	1k	6-11009C49	47k	6-11009C89
24	6-11009C10	1.1k	6-11009C50	51k	6-11009C90
27	6-11009C11	1.2k	6-11009C51	56k	6-11009C91
30	6-11009C12	1.3k	6-11009C52	62k	6-11009C92
33	6-11009C13	1.5k	6-11009C53	68k	6-11009C93
36	6-11009C14	1.6k	6-11009C54	75k	6-11009C94
39	6-11009C15	1.8k	6-11009C55	82k	6-11009C95
43	6-11009C16	2k	6-11009C56	91k	6-11009C96
47	6-11009C17	2.2k	6-11009C57	100k	6-11009C97
51	6-11009C18	2.4k	6-11009C58	110k	6-11009C98
56	6-11009C19	2.7k	6-11009C59	120k	6-11009C99
62	6-11009C20	3k	6-11009C60	130k	6-11009D01
68	6-11009C21	3.3k	6-11009C61	150k	6-11009D02
75	6-11009C22	3.6k	6-11009C62	160k	6-11009D03
82	6-11009C23	3.9k	6-11007C63	180k	6-11009D04
91	6-11009C24	4.3k	6-11009C64	200k	6-11009D05
100	6-11009C25	4.7k	6-11009C65	220k	6-11009D06
110	6-11009C26	5.1k	6-11009C66	240k	6-11009D07
120	6-11009C27	5.6k	6-11009C67	270k	6-11009D08
130	6-11009C28	6.2k	6-11009C68	300k	6-11009D09
150	6-11009C29	6.8k	6-11009C69	330k	6-11009D10
160	6-11009C30	7.5k	6-11009C70	360k	6-11009D11
180	6-11009C31	8.2k	6-11009C71	390k	6-11009D12
200	6-11009C32	9.1k	6-11009C72	430k	6-11009D13
220	6-11009C33	10k	6-11009C73	470k	6-11009D14
240	6-11009C34	11k	6-11009C74	510k	6-11009D15
270	6-11009C35	12k	6-11009C75	560k	6-11009D16
300	6-11009C36	13k	6-11009C76	620k	6-11009D17
330	6-11009C37	15k	6-11009C77	680k	6-11009D18
360	6-11009C38	16k	6-11009C78	750k	6-11009D19
390	6-11009C39	18k	6-11009C79	820k	6-11009D20
430	6-11009C40	20k	6-11009C80	910k	6-11009D21
				1 meg	6-11009D22

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instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81039E45-A Spectra TAC Total Area Coverage, Voting and Satellite Receivers

REVISION DETAILS:

Due to a printing error, page 2 of INSTALLATION section 68P81026E22-E is incorrect. The proper page is printed on the back of this sheet.

Step 3. Similarly, mount the larger cover on top of the whole cabinet.

4.2 WITHOUT CABINET

The receiver chassis has provisions for 19" rack mounting. The receiver may be placed on a desk, shelf, or any other level surface. The location of the receiver should insure convenient connections to the power source and the transmission line to the antenna. Care should be taken to see that the receiver is protected from any potentially harmful environmental conditions.

5. CONNECTIONS

5.1 POWER CONNECTIONS

5.1.1 Connection to 120 V AC (50 or 60 Hz)

Insure that the switch on each receiver power supply (located on the rear of the chassis) is set to the 120 V position. Each receiver power supply may be cascaded in parallel by plugging the external female jack into the chassis mounted male connector on the above adjacent supply. This will cause the female connector on the upper supply to remain unconnected. The lowest receiver power supply should be connected directly to the nearest 120 V ac power source using the TLN5960A Line Cord Kit.

5.1.2 Connection to 240 V AC (50 or 60 Hz)

Set the switch on each receiver power supply to the 240 V ac position. Replace the 1/2 amp fuse in the power supply with a 1/4 amp slow blow fuse. Each receiver power supply may be cascaded in parallel by plugging the external female jack into the chassis mounted male connector on the above adjacent supply. This will cause the female connector on the upper supply to remain unconnected. Remove the plug from the TLN5960A Line Cord Kit and replace it with a suitable termination that is compatible with the 240 V ac source. Connect the power cord to the 240 V source.

5.1.3 Emergency Battery Installation

5.1.3.1 Battery Mounting

Two rechargeable 12 V batteries can be mounted on the bottom of the receiver cabinet. If additional batteries are required, a TRN6342A Mounting Rack should be used.

NOTE

All Motorola batteries are shipped separately from the equipment and should be kept charged until time of usage for maximum utilization purposes.

5.1.3.2 Using TKN6760A Cable Kit

Remove the back cover of the receiver. Observing proper polarity, attach the two spade lugs on the end of the cable to their respective screw terminals [BATT (+), BATT (-)] on the power supply circuit board. Route the cable through the hold provided for the power cord while replacing the back cover. Connect the remaining end of the cable to the battery. The battery should be mounted on the floor of the cabinet or on the TRN6342A Mounting Rack. Each rack provides mounting for two batteries.

NOTE

Most rechargeable 12 V batteries may be used, but the TLN5633A Battery kit is recommended. Use of any other battery could result in any of the following problems:

1) Damage due to excessive current. The charging circuit in the power supply limits the charging current to 800 mA . Make sure that the battery used is rated to handle at least 800 mA.

2) Increased charging time. If the battery is rated for a maximum current that greatly exceeds 800 mA the charge time of the battery might exceed the time listed in the Power Supply section of the manual.

3) Heat damage from continuous charging current. The battery charging circuit is constantly providing current to the battery even when it is fully charged. This will not damage the TLN5633A, but may damage some other rechargeable 12 V batteries.

4) Incompatibility with TKN6760A Cable Kit. Using another battery may require changing the plug on the battery end of the cable.

5.1.3.2 Without TKN6760A Cable Kit

Remove the back cover of the receiver. Attach one end of a fabricated cable to

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instruction manual revision

GENERAL

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INSTRUCTION MANUALS AFFECTED:

68P81039E45-A *Spectra-TAC* Voting and Satellite Receivers

REVISION DETAILS:

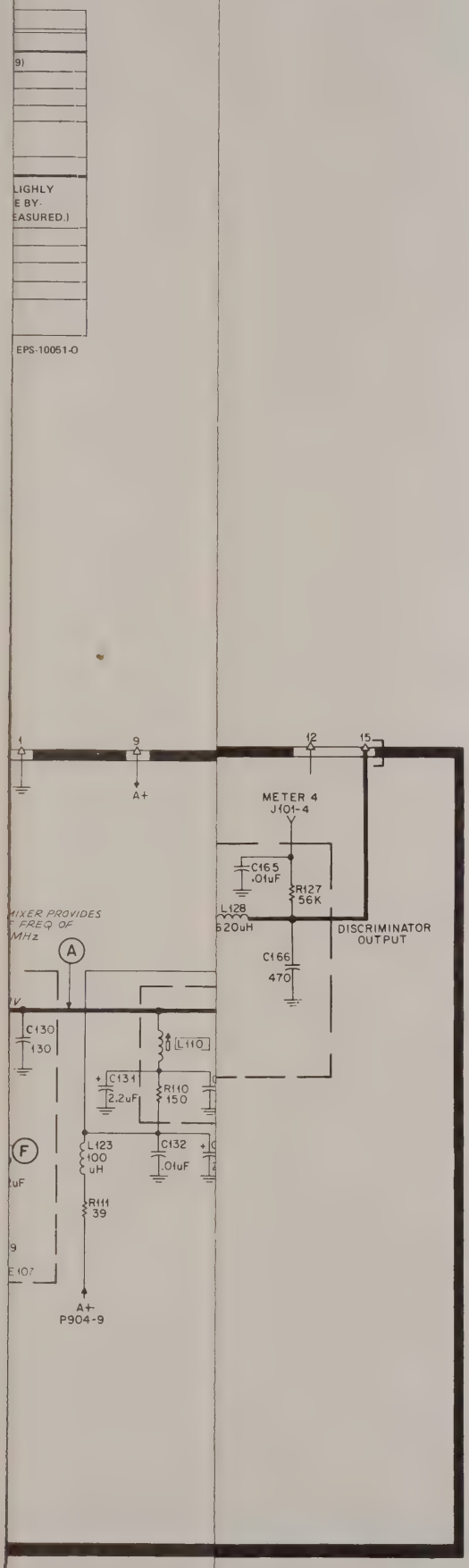
The schematic diagrams and parts lists for the TLC6121A and TLB6850B Series Receiver RF and I-F Boards have been revised. Replace diagram PEPS-17895 with the attached, revised issue C diagram. Replace diagram PEPS-17908 with the attached revised issue D diagram. Note the following changes on parts lists PL-3492 and PL-2078 behind the receiver tab in your manual.

Reference Symbol	Motorola Part No.	Description
		CAPACITOR, fixed: pF ±5%, 500 V: unless otherwise stated
C140, 141	21-82450B37	0.47 uf.
C142	21-840D47	150
C143	21-84426B11	470
C150	21-863205	4.25 ±0.25 pF
C151	21-82450B37	0.47 uF
		CAPACITOR, fixed: pF ±5%, 500 V: unless otherwise stated
C152	21-859938	75
C153	21-865441	170 ±3%

Reference Symbol	Motorola Part No.	Description
		CHOKE:
L126	24-82549D09	15 uH
		RESISTOR, fixed ±5%, 1/4 W:
R116	6-11009C49	1k
R117, 118	6-11009C89	47k
R119	6-11009C49	1k
R120	6-11009C45	680
R121	6-11009C85	33k
R122	6-11009C49	1k
		CRYSTAL UNIT, quartz:
Y101	48-84259B07	i-f filter
Y102	48-84259B08	i-f filter
Y103	48-84259B07	i-f filter
Y104	48-84259B09	i-f filter
Y105	48-84259B09	i-f filter

ATTACHMENTS:

TLB6850C Series Receiver RF and I-F Board Diagram.....PEPS-17895-C
TLC6112A and TLC6112B Receiver RF and I-F Board Diagram.....PEPS-17908-D



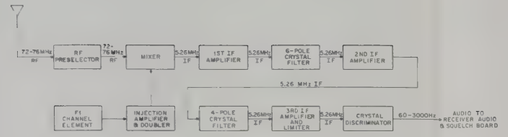
PARTS LISTS SHOWN ON
BACK OF THIS DIAGRAM
Receiver RF & I-F Schematic and Block Diagrams
Motorola No. ***PEPS-17908-D***
3/12/86- UP

MID BAND RECEIVER RF & I-F BOARD

Reference Symbol	Motorola Part No.	Description
		CHOKE:
L126	24-82549D09	15 uH
		RESISTOR, fixed ±5%, 1/4 W:
R116	6-11009C49	1k
R117, 118	6-11009C89	47k
R119	6-11009C49	1k
R120	6-11009C45	680
R121	6-11009C85	33k
R122	6-11009C49	1k
		CRYSTAL UNIT, quartz:
Y101	48-84259B07	i-f filter
Y102	48-84259B08	i-f filter
Y103	48-84259B07	i-f filter
Y104	48-84259B09	i-f filter
Y105	48-84259B09	i-f filter

ATTACHMENTS:

TLB6850C Series Receiver RF and I-F Board Diagram.....PEPS-17895-C
TLC6112A and TLC6112B Receiver RF and I-F Board Diagram.....PEPS-17908-D



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DC VOLTAGE TABLE FOR IC'S

PIN	VOLTAGE
	IC101
1	3.0V (SLIGHTLY HIGHER THAN PINS 8 AND 11)
2	6.0V (VARIES WITH 8.5V LINE)
3	7.2V
4	6.4V
5	2.8V (PINS 5 AND 9 MUST BE EQUAL)
6	
	IC102
1	3.0V (PINS 1 AND 3 MUST BE EQUAL AND SLIGHLY HIGHER THAN PINS 8 AND 11. PIN 1 MUST BE BY PASSED TO GND WITH .01 µF CAP. WHEN MEASURED.)
2	6.2V (2.0V LOWER THAN PIN 5)
5	9.2V (VARIES WITH 8.5V LINE)
6	7.2V
7	6.4V
8	2.8V (PINS 8 AND 9 MUST BE EQUAL)
9	

EPS-10061-O

RF VOLTAGE TABLE

SET RF INPUT AT ANT TO OBTAIN (NOTE 103)	AT TEST POINT	RF INPUT SHOULD BE (MAY VARY APPROX 2 TO 1)
0.5V	A	5.0 mV
100 mV	B	8.0 mV
	C	5.0 mV
	D	19.0 mV
	E	28.0 mV

SIG GEN SET TO RECEIVER CHAN FREQ.

TEST POINT	RANGE	RF VOLTAGE (NOTE 103)
F	72-76 MHz	5.8-1.5V

EPE 10052-A

RECEIVER RF & IF BOARD

101 RECEIVER FREQUENCY CALCULATIONS - SEE ALIGNMENT PROCEDURE

102 DASHED LINES REPRESENT SHIELDING

103 RF MEASUREMENTS TAKEN WITH MOTOROLA SOLID-STATE DC MULTIMETER WITH PLUG-IN RF PROBE

104 UNLESS OTHERWISE STATED DC VOLTAGES GIVEN ARE NOMINAL AND MAY VARY ±.25 PER CENT. DC VOLTAGES ARE MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND

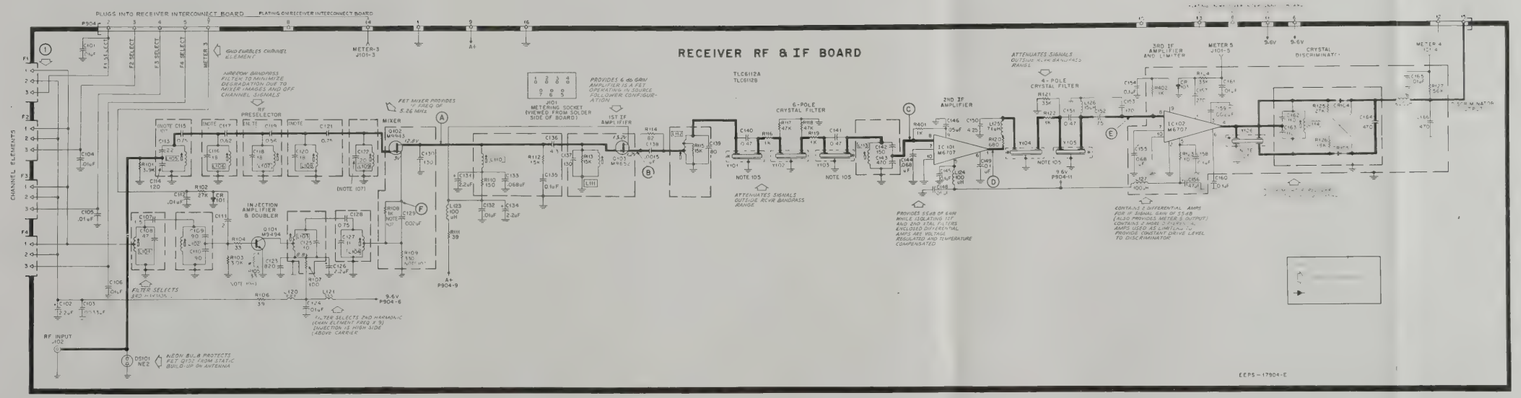
105 INDEX ASTERISK ON CRYSTAL CAN INDICATES PHYSICAL ORIENTATION

106 VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS

107 USED IN MODEL TLC6112B ONLY

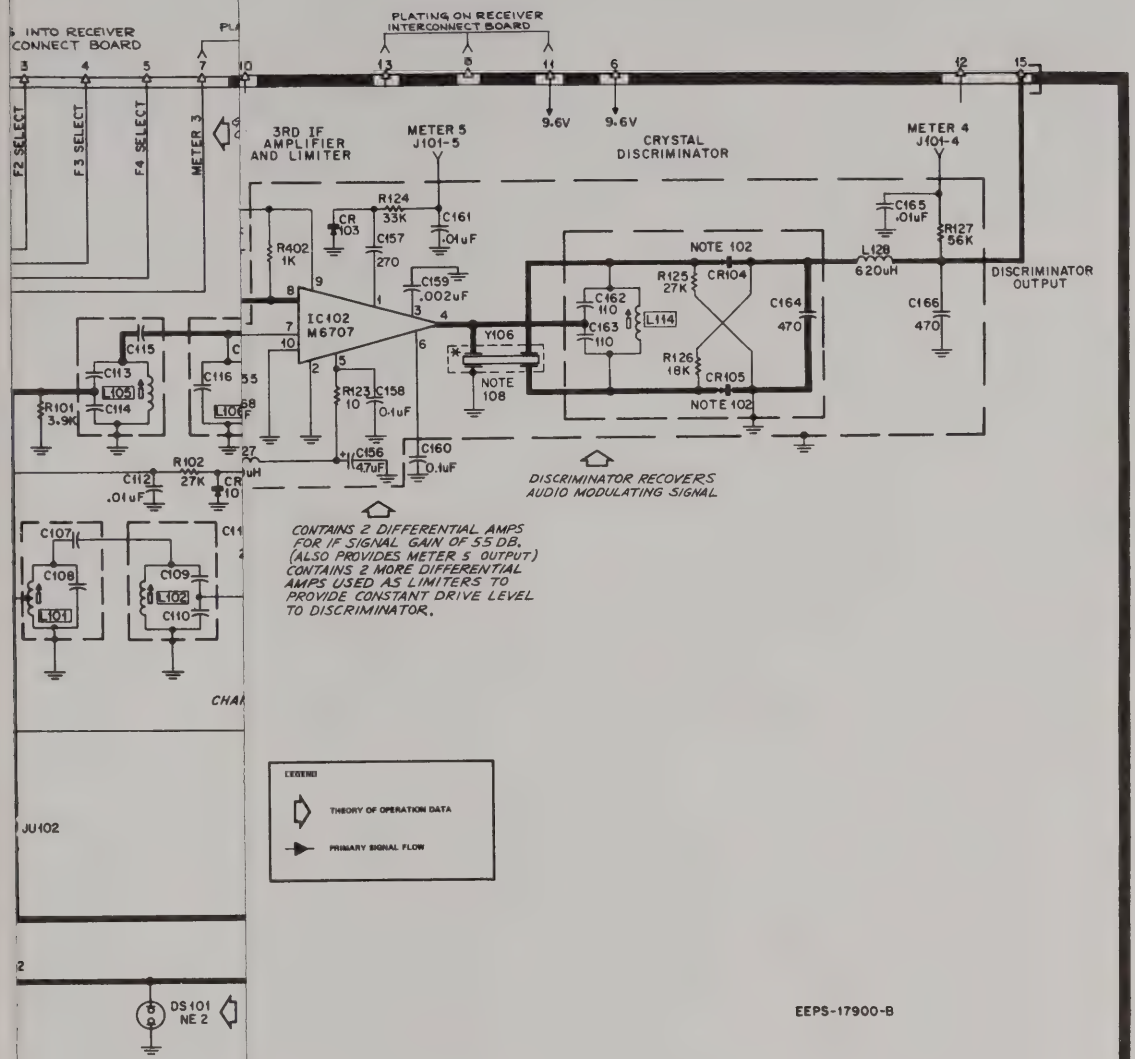
108 R106 IS USED IN MODEL TLC6112A ONLY

EPS-10050-A

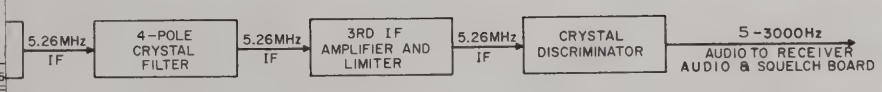


PARTS LISTS SHOWN ON BACK OF THIS DIAGRAM
Receiver RF & I-F Schematic and Block Diagrams
Motorola No. PEPS-17908-D
3/12/86- UP

MID BAND RECEIVER RF & I-F BOARD



MODELS)



EEPS-17899-A

ONENT VALUES

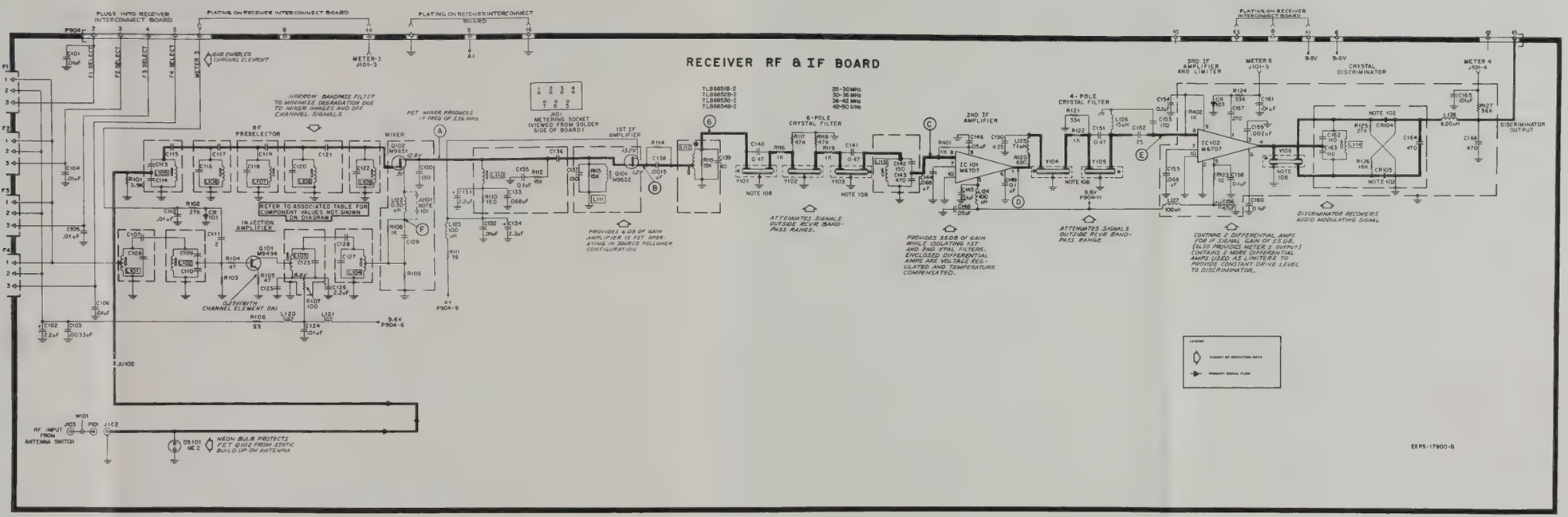
30–36 MHz	36–42 MHz	42–5
1.8	1.2	1.5
56	40	47
105	62	90
105	90	90
60	40	27
270	220	160
2.7	1.5	1.2
51	36	24
1.8	1.2	.82
51	36	24
1.5	1.2	.75
51	36	24
1.2	.82	.82
13	11	5
3300	1500	1500
51	39	43
56	40	51
1.5	1.2	1.2
3300	3300	1500
NOT USED	NOT USED	0.30
3.9k	3.0k	3.0k
560	470	100

EPS-17897-O

LOW BAND RECEIVER RF & IF BOARD

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17895-C
2/28/86-UP


RECEIVER RF & IF BOARD
PLUGS INTO RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
P904-F
F1 SELECT
F2 SELECT
F3 SELECT
F4 SELECT
METER 3
BAR ENABLES CHANNEL ELEMENT
METER-3 J101-3
A+
9.6V
9.6V
CRYSTAL DISCRIMINATOR
METER 5 J101-5
METER 4 J101-4
3RD IF AMPLIFIER AND LIMITER
DISCRIMINATOR OUTPUT
NARROW BANDPASS FILTER TO MINIMIZE DEGRADATION DUE TO MIXER IMAGES AND OFF CHANNEL SIGNALS
FET MIXER PRODUCES I.F. FREQ OF 5.26 MHz
J101 METERING SOCKET (VIEWED FROM SOLDER SIDE OF BOARD)
RF PRESELECTOR
MIXER
1ST IF AMPLIFIER
TLB6851B-2
TLB6851B-3
TLB6530-2
TLB6548-2
25-30MHz
30-36 MHz
36-42 MHz
42-50 MHz
6-POLE CRYSTAL FILTER
2ND IF AMPLIFIER
4-POLE CRYSTAL FILTER
NOTE 102
NOTE 108
REFER TO ASSOCIATED TABLE FOR COMPONENT VALUES NOT SHOWN ON DIAGRAM
INJECTION AMPLIFIER
0.25V WITH CHANNEL ELEMENT ON
PROVIDES 6 DB OF GAIN AMPLIFIER IS FET OPERATING IN SOURCE FOLLOWER CONFIGURATION
ATTENUATES SIGNALS OUTSIDE RCVR BAND-PASS RANGE.
PROVIDES 55DB OF GAIN WHILE ISOLATING 1ST AND 2ND XTAL FILTERS. ENCLOSED DIFFERENTIAL AMPS ARE VOLTAGE REGULATED AND TEMPERATURE COMPENSATED.
ATTENUATES SIGNALS OUTSIDE RCVR BAND-PASS RANGE
CONTAINS 2 DIFFERENTIAL AMPS FOR I.F. SIGNAL GAIN OF 55 DB. (ALSO PROVIDES METER 5 OUTPUT) CONTAINS 2 MORE DIFFERENTIAL AMPS USED AS LIMITERS TO PROVIDE CONSTANT DRIVE LEVEL TO DISCRIMINATOR.
DISCRIMINATOR RECOVERS AUDIO MODULATING SIGNAL
DISCRIMINATOR OUTPUT
W101
J103
P101
J102
RF INPUT FROM ANTENNA SWITCH
DS101 NE 2
NEON BULB PROTECTS F.E.T. Q102 FROM STATIC BUILD UP ON ANTENNA
JU102
A+ P904-9
9.6V P904-6
LEGEND
THEORY OF OPERATION DATA
PRIMARY SIGNAL FLOW
EEPS-17900-B

RCVR CHAN DC VOLTAGE TABLE FOR IC'S

PIN	VOLTAGE
	IC101
1	3.0 V (SLIGHTLY HIGHER THAN PINS 8 AND 9)
5	9.5 V (VARIES WITH 9.6 V LINE)
6	7.2 V
7	8.4 V
8	2.9 V (PINS 8 AND 9 MUST BE EQUAL)
9	
	IC102
1	3.0 V (PINS 1 AND 3 MUST BE EQUAL AND SLIGHTLY HIGHER THAN PINS 8 AND 9. PIN 1 MUST BE BYPASSED TO GND WITH .01 uF CAP. WHEN MEASURED.)
3	
4	6.3 V (3.0 V LOWER THAN PIN 5)
5	9.3 V (VARIES WITH 9.6 V LINE)
6	7.2 V
7	8.4 V
8	2.9 V (PINS 8 AND 9 MUST BE EQUAL)
9	

EPS-6236-O

RF & IF COMPONENT VALUES

REFERENCE	25–30 MHz	30–36 MHz	36–42 MHz	42–50 MHz
C107	2	1.8	1.2	1.5
C108	75	56	40	47
C109	150	105	82	90
C110	150	105	90	90
C113	100	80	40	27
C114	220	270	220	160
C115	8	2.7	1.5	1.2
C116	68	51	36	24
C117	4.3	1.8	1.2	82
C118	75	51	36	24
C119	3.7	1.8	1.2	75
C120	75	51	36	24
C121	1.2	1.2	82	82
C122	22	13	11	5
C123	3300	3300	1500	1500
C125	75	51	39	43
C127	75	68	40	51
C128	2.2	1.5	1.2	1.2
C129	3300	3300	3300	1500
L122	NOT USED	NOT USED	NOT USED	0.30 uH
R102	3.9k	3.9k	3.9k	3.9k
R109	270	560	470	100

EPS-17897-O

RECEIVER RF & IF BOARD

101. JUMPER JU101 REPLACES CHOKE IN 25–42 MHz MODELS ONLY.
102. DIODE POLARITY CORRECT AS SHOWN FOR THE 25–42 MHz RANGES. DIODE POLARITY REVERSED FOR THE 42–50 MHz RANGE.
103. RECEIVER FREQUENCY CALCULATIONS. SEE ALIGNMENT PROCEDURE
104. DASHED LINES REPRESENT SHIELDING.
105. RF MEASUREMENTS TAKEN WITH MOTOROLA SOLID–STATE DC MULTI–METER WITH PLUG–IN RF PROBE.
106. RF MEASUREMENTS TAKEN WITH "EXTENDER" CHANNEL PROPERLY ALIGNED AND GAIN SET.
107. UNLESS OTHERWISE STATED, DC VOLTAGES GIVEN ARE NOMINAL AND MAY VARY +25 PER CENT. DC VOLTAGES ARE MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND.
108. INDEX ASTERISK ON CRYSTAL CAN INDICATES PHYSICAL ORIENTATION.
109. UNLESS OTHERWISE STATED CAPACITOR VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.

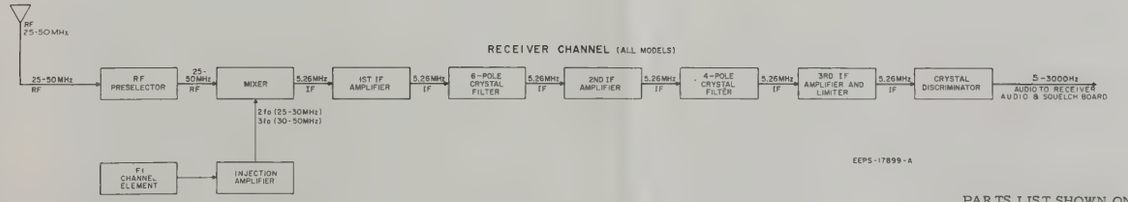
EPS-17898-O

RECEIVER CHANNEL RF VOLTAGE TABLE

SET RF INPUT AT ANT TO OBTAIN (NOTE 106)	AT TEST POINT	SIG GEN OUTPUT LEVEL SHOULD BE (MAY VARY APPROX 2 TO 1)	
0.5 V	A	8.0 mV	SIG GEN SET TO RECEIVER CHAN FREQ
100 mV	B	8.0 mV	
	C	5.0 mV	
	D	10.0 V	
	E	20.0 V	

TEST POINT	RANGE	RF VOLTAGE (NOTE 105)
F	25-42 MHz	1.9–2.8 V
	42-50 MHz	0.9–1.5 V

EPS 6335-C



PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17895-C
2/28/86-UP

MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81017E25	*Micor Compa-Station*, Base and Repeater Station 76-76 MHz
68P81013E60-G	*Micor Compa-Station*, Base and Repeater Radio 25-50 MHz; 100 W
68P81063E10-A	Link Receiver Options
68P81064E10-O	*PURC 5000* LINK RECEIVER OPTIONS
68P81013E70-F	*Micor Compa-Station* Base Radio 25-50 MHz
68P81039E45-A	*Spectra-TAC* Total Area Coverage

REVISION DETAILS:

1. 68P81013E60-G and 68P81013E70-F manuals.
   On Service Sheet 68P81104E26-H, revise step 4 in Non-extender Receiver Alignment (EPS-9620-O) to read as shown in copy A.

2. 68P81017E25-C manual.
   In section 68P81026E36-C and Service Sheet 68P81104E57-C, EPS-10349-O (add copy A) revise step 4 in D. Alignment Procedure and Receiver Alignment (EPS-10349-O) respectively to read as shown in copy A.

3. 68P81063E10-A, 68P81064E10-O and 68P81039E45-A manuals
   In section 68P81026E36, page 5, change step 4 in D. Alignment Procedure to read as shown in copy A.

MOTOROLA INC.

instruction manual revision

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INSTRUCTION MANUAL AFFECTED:

68P81017E25	*Micor Compa-Station*, Base and Repeater Station 76-76 MHz
68P81013E60-G	*Micor Compa-Station*, Base and Repeater Radio 25-50 MHz; 100 W
68P81063E10-A	Link Receiver Options
68P81064E10-O	*PURC 5000* LINK RECEIVER OPTIONS
68P81013E70-F	*Micor Compa-Station* Base Radio 25-50 MHz
68P81039E45-A	*Spectra-TAC* Total Area Coverage

REVISION DETAILS:

1. 68P81013E60-G and 68P81013E70-F manuals.
   On Service Sheet 68P81104E26-H, revise step 4 in Non-extender Receiver Alignment (EPS-9620-O) to read as shown in copy A.

2. 68P81017E25-C manual.
   In section 68P81026E36-C and Service Sheet 68P81104E57-C, EPS-10349-O (add copy A) revise step 4 in D. Alignment Procedure and Receiver Alignment (EPS-10349-O) respectively to read as shown in copy A.

3. 68P81063E10-A, 68P81064E10-O and 68P81039E45-A manuals
   In section 68P81026E36, page 5, change step 4 in D. Alignment Procedure to read as shown in copy A.

4	RF & I-F	5	METER REV.	RCUR	5	L110, L111, L112, L113,	INTERMEDIATE FREQUENCY- If the i-f has been completely misaligned, pre-position slugs approximately 1/4 inch from the board, otherwise, proceed as follows. Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal modulated with a 1 kHz tone at 5 kHz deviation sufficient for an indication of about 20 microamperes on meter position 5. Peak L110 thru L113. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 microamperes. Repeat.

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instruction manual revision

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This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81033E20-A	*PULSAR* Tone Remote Adaptor for IMTS Base Stations
68P81033E25-C	*PULSAR* Tone Remote Control Interface Unit
68P81039E45-A	*Spectra-TAC* Voting and Satellite Receivers
68P81039E50-A	*Spectra-TAC* Total Area Coverage Comparator
68P81063E95-A	*GCC-80* D2000 Series General Communications Controller

REVISION DETAILS:

The parts list for the TKN6760A Battery Cable Kit has been revised as follow:

Reference Symbol	Motorola Part No.	Description	Change
--	29-859118	LUG, crimp	Added
--	39-10061A23	CONTACT, male (large)	Deleted

Please note the above changes on PL-3472 in your manuals as indicated below:

Manual No.	Section No. Affected
68P81033E20	68P81039E36
68P81033E25	68P81039E36
68P81039E45	68P81035E41
68P81039E50	68P81039E36
68P81063E95	68P81040E66

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instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81025E50-H	*Micor* Base and Repeater Stations 406-512 MHz
68P81033E10-A	*PULSAR* IMTS Base Stations 450-512 MHz
68P61039E45-A	*Spectra-TAC* Voting and Satellite Receivers
68P81039E55-A	*Micor* Base and Repeater Stations 406-512 MHz

REVISION DETAILS:

The parts list for the TLE8031A, TLE8032A, and TLE8033A Receiver RF and I-F Board has been revised as follows:

Reference Symbol	Motorola Part No.	Description	Change
--	3-138162	SCREW, machine: 4-40 x 3/8; 8 used	Replaces 3-139506

Please note the above change to PL-1879 in your manual(s) as indicated below.

Manual No.	Section/Diagram Affected
68P81025E50	PEPS-17752
68P81033E10	PEPS-17752
68P81039E45	PEPS-17926
68P81039E55	PEPS-17752

MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81017E70-E	Digital *HEAR* DC Remote Control Console
68P81017E75-B	Digital *HEAR* Tone Remote Control Console
68P81033E20-A	*PULSAR* Tone Remote Adapter for *IMTS* Base Stations
68P81033E25-C	*PULSAR* Tone Remote Control Interface Unit
68P81039E45-A	*Spectra-TAC* Voting and Satellite Receiver
68P81039E50-A	*Spectra-TAC* Voting Comparator
68P81063E95-A	*GCC-80* D2000 Series General Communications Controller
68P81069E45-A	*SECURENET* Digital Voice Modem

REVISION DETAILS:

The parts list for the TKN6323A, TKN6760A, and TKN8472A Battery Cable Kits have been revised to change the two conductor cable from part no. 30-83155H01 to 30-83165R01. Please note this change in your manual as follows:

MANUAL NO.	SECTION/ DIAGRAM NO.	KIT NO.
68P81017E70	PEPS-10395	TKN6323A
68P81017E75	PEPS-10684	TKN6323A
68P81033E20	68P81039E36	TKN6760A
68P81033E25	68P81039E36	TKN6760A
68P81039E45	68P81035E41	TKN6760A
68P81039E50	68P81039E36	TKN6760A
68P81063E95	68P81040E66	TKN6760A
68P81069E45	68P81070E31	TKN8472A
68P81069E45	68P81071E76	TKN8472A

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instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81039E45-A *SPECTRA TAC* Total Area Coverage Voting and Satellite Receivers

REVISION DETAILS:

The 400 Hz equalization jumper positions shown on Figure 2 in the Maintenance section (page 5) are incorrect. The correct positions are as indicated in this replacement for Figure 2.

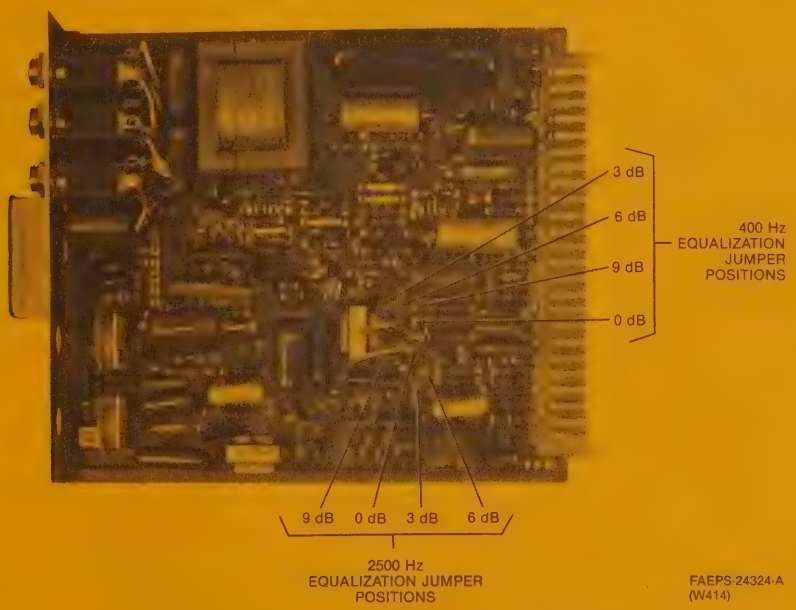


Figure 2. Audio Control Module Line Equalization Jumper Locations

MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUALS AFFECTED:

68P81038E85-C	*MICOR* TRUNKED REPEATER 851-866 MHz Transmit 806-821 MHz Receive
68P81039E45-A	*Spectra-TAC* Voting and Satellite Receivers

REVISION DETAILS:

Add the attached section 68P81076E66-O to your manual. The section contains documentation for the TLN3005A Connect Tone Decoder Module which may have been added to your station as an option item.

SMR-5465
11/6/87

MOTOROLA INC.
Communications
Sector

CONNECT TONE DECODER MODULE
MODEL TLN3005A

1. DESCRIPTION

The TLN3005A Connect Tone Decoder (CTD) Module is a plug-in unit for the Trunked Spectra-TAC™ Satellite Receiver and the Trunked Micor™ Base Station. The module consists of a TFN6055A Connect Tone Filter Board and a TRN9917A Logic Board. These two boards are interconnected to form the CTD module. The module decodes sub-audible connect and disconnect tones received from a transmitting subscriber unit. As a result of these tones, RECEIVER DATA, MUTE, and RCVR UNSQU IND signals in the module mute and unmute receiver audio.

2. INSTALLATION

Normally, the CTD module is factory-installed and requires no field modification. However, if it is installed in the field, use the following instructions.

2.1 INSTALLATION IN A SATELLITE RECEIVER

Step 1. Disconnect the satellite receiver power.

Step 2. Connect CTD board jumpers JU1 and JU2 to lower positions (pins 2 and 3).

Step 3. Insert the module in the RCVR SERVICE slot.

Step 4. Connect wire jumpers on the satellite receiver as shown in Table 1.

Step 5. Connect satellite receiver power.

Step 6. Perform a basic functional test of the module by capturing the satellite receiver with trunked portable. The decode LED (on the CTD filter board) lights if the module is operating and receiving the proper connect tone.

2.2 INSTALLATION IN A PRIME/REMOTE SITE *MICOR* STATION

Step 1. Disconnect base station power.

Step 2. If the system contains *Spectra-TAC* encoders, insure that the *Spectra-TAC* encoder has JU1 OUT and R33 IN, and the squelch gate module has JU4 IN and at JU14 5k resistor is in series to CS position.

Step 3. Insure the line driver module has JU1 OUT, and a diode added with anode at junction R82, R81, and CR6, and cathode at edge connector pin 5.

Step 4. Connect jumper block JU1 on the CTD module to lower position (pins 2 and 3) and JU2 to upper position (pins 1 and 2).

Step 5. Insert the CTD module in slot 10 (next to the *Spectra-TAC* Encoder).

Step 6. Connect wire jumpers on the *Micor* backplane as shown in Table 2.

Table 1. Backplane Wiring

Wire From:		Wire To:		
Slot	Pin #	Slot	Pin #	Function
Spectra-TAC Encd	16	rcvr service	7	audio mute
*	*	rcvr service	9	mute
Disc Amp	13	rcvr service	10	rcvr data
Spectra-TAC Encd.	11	rcvr service	14	rcvr unsq ind

* The mute line is contained in the cable that interconnects the remote receiver site controller (RESC) and the satellite receiver. It is normally dressed back and not connected to the satellite receiver. Solder the mute line (blue wire) to pin 9 of the CTD (rcvr service) slot.

Table 2. Prime/Remote Micor Backplane Wiring

Wire From:		Wire To:		Function
Slot	Pin #	Slot	Pin #	
#12 TCM	10	#10 CTD	6	9.6 V
#1 line drvr #11 *Spectra TAC* Encdr	5 16	#10 CTD	7	audio mute
#12 TCM	14	#10 CTD	9	mute
#12 TCM	13	#10 CTD	10	rcvr data
#12 TCM	11	#10 CTD	14	rcvr unsqu ind

Step 7. Connect base station power.

Step 8.Perform basic functional test of the CTD module by capturing the *Micor* receiver with a trunked portable. The decode LED (on the CTD filter board) lights if the module is operating and receiving the proper connect tone.

2.3 INSTALLATION IN STANDARD (NON-WIDE AREA) *MICOR* BASE STATION

Step 1. Disconnect base station power.

Step 2. Connect jumper blocks JU1 in the lower position (pins 2 and 3) and JU2 in the upper position (pins 1 and 2).

Step 3. Insert the CTD module in slot 10.

Step 4. Install wire jumpers on the *Micor* backplane as shown in Table 3.

Step 5. Connect base station power.

Step 6. Perform basic functional test of the CTD module by capturing the *Micor* receiver with a trunked portable. The decode LED (on the CTD filter board) lights if the CTD is operating and receiving the proper connect tone.

2.4 INSTALLATION IN A *MICOR* BASE STATION UTILIZING QRN4313A *SECURENET* TRUNKED BASE-REPEATER INTERCONNECT BOARD.

Step 1. Disconnect base station power.

Step 2. Connect CTD module jumper blocks JU1 and JU2 to their upper position (pins 1 and 2).

Step 3. Insert the CTD module in slot P6.

Step 4. Connect base station power.

Step 5. Perform basic functional test of the CTD module by capturing the *Micor* receiver with a trunked portable. The decode LED (on the CTD filter board) lights if the CTD module is operating and receiving the proper connect tone.

3. FUNCTIONAL THEORY OF OPERATION

3.1 The CTD module allows station receive audio to be repeated when a proper sub-audible connect tone from the transmitting subscriber unit is decoded. The decoding process starts when the station discriminator amplifier feeds RECEIVER DATA signal to the module. The CTD filter board low-pass filters and limits the data signal. The data signal is routed to the logic board microcomputer where decoding is then accomplished with a correlation-type software algorithm.

3.2 If connect tone is not decoded, the repeat receive audio is muted. In a wide area (*Spectra-TAC,* Simulcast) system, the CTD module does not allow audio to the voting processor; and subsequently the station audio is

Table 3. Standard Micor Backplane Wiring

Wire From:		Wire To:		Function
Slot	Pin #	Slot	Pin #	
#12 TCM	10	#10 CTD	6	9.6 V
#12 TCM	15	#10 CTD	7	audio mute
#12 TCM	14	#10 CTD	9	mute
#12 TCM	13	#10 CTD	10	rcvr data
#12 TCM	11	#10 CTD	14	rcvr unsq ind.

not allowed in the voting process. However, if a valid connect tone is decoded, the receive audio path is unmuted. In a wide-area system, the audio is allowed in the voting process. The CTD module also enables a LED (light emitting diode) on the CTD filter board, indicating that proper connect tone is being detected.

3.3 The microprocessor software also uses two other signals to decide whether to mute or unmute the receive audio path. One of the signals is labeled MUTE, which comes from the site controller. The central controller toggles the MUTE line negative going approximately 1.6 ms for a new assignment or for a PTT ID re-assignment to the channel. When toggled, the CTD module immediately unmutes the receive audio path for a period referred to as mute hold-off time (Tmh). During this time, the CTD module does not require a valid connect tone to unmute the audio path. After mute hold-off time, the CTD module mutes the audio path if a valid tone is not detected. For details, see the logic flow diagram shown in Figure 1.

3.4 The other signal, labeled RCVR UNSQU IND, comes from the station receiver squelch circuit. This signal indicates the presence of carrier. If carrier is present just prior to receiving a "start of call toggle" from the site controller, the CTD module does NOT unmute the receive audio path until a valid connect tone is detected. In this case, the CTD module assumes that an interfering carrier is present on the channel and does not unmute the channel until valid connect tone is decoded.

3.5 Additionally, the receive audio path is immediately muted if the 163.6 Hz disconnect tone is detected from the transmitting subscriber unit. This tone is transmitted for 200 ms following release of PTT and aids in eliminating unwanted noise at the end of transmissions.

4. DETAILED THEORY OF OPERATION

(Refer to schematic diagram).

4.1 TFN6055A CTD FILTER BOARD

4.1.1 Inputs

4.1.1.1 The RECEIVER DATA input is received on edge connected pin 3 or 10 as determined by JU1. The data then passes through a 7-pole low-pass Butterworth filter with a cutoff frequency at 200 Hz. From the output of the filter, the signal goes to the center slicer which converts the analog filtered data into a square digital bit stream that is fed to the processor for decoding. The center slicer compensates for any shift in the average dc value for any variations in data amplitude by shifting the comparator's reference input so that it lies exactly halfway between the serial data bit peaks. The output of the comparator drives open collector transistor Q1 which is fed to the microcomputer via wire jumper W3.

4.1.1.2 The MUTE line is buffered with emitter follower transistor Q4 and associated components. This is an active low input (muted 0 V) and is inverted by Q4 and input to the microcomputer via wire jumper W11.

4.1.1.3 The RCVR UNSQU IND input to the microcomputer is diode isolated by CR3 and pulled up by resistor R24. This is active high when carrier is present.

4.1.1.4 The +9.6 V is input on edge connector Pin 6 or 8 and is used as Vcc for the two quad op-amp ICs on the filter board. It also drives the 5 V voltage regulator U3. The 5 V is coupled to the microcomputer board via wire jumper connector W2.

4.1.2 Outputs

4.1.2.1 Microcomputer U1 initiates the AUDIO MUTE signal. Open-collector transistor Q3 couples the signal from U1 pin 18 to the board edge connector pin 7. When pin 7 goes low, the receive audio is muted.

4.1.2.2 The microcomputer DECODE output at pin 17 is routed through wire jumper W7 to LED driver transistor Q2. When lit, DS1 indicates a valid connect tone has been decoded.

4.2 TRN9917A LOGIC BOARD

4.2.1 The microcomputer and associated components are part of the TRN9917A Logic Board contained under the metal shield. The central logic unit of the CTD is composed of microcomputer U1, octal latch U2, hex buffers U4 and U5 (with associated switch set S1), and address decoders U6 and U7. Timers U8 and U9 perform a watchdog function, keeping track of the microcomputer tickle pulses.

4.2.2 Microcomputer U1 contains the master clock and timing generator, microprocessor, and 128 8-bytes of RAM. The processor communicates with the other circuitry of the CTD module via four ports. Port 1 (pins 6-10) accepts the conditioned signals from the RECEIVER DATA line and services the watchdog circuitry. Diodes CR9 and CR10 set the processor mode as Extended Multiplexed. Port 2 (pins 13-19) handles all the input/output control signals. Port 3 (pins 22-29) provides the upper eight bits of the address bus. Port 4 (pins 30-37) provides the lower eight bits of the address bus. Port 4 (pins 30-37) provides the lower eight bits of address (through octal latch U2) and carries data from the data bus.

4.2.3 ROM U3 contains the program information the microcomputer needs to detect and process connect and disconnect tones. Address selection is done on pins 1-8, 19, 22, and 23. Data is brought out on pins 9-11 and 13-17.

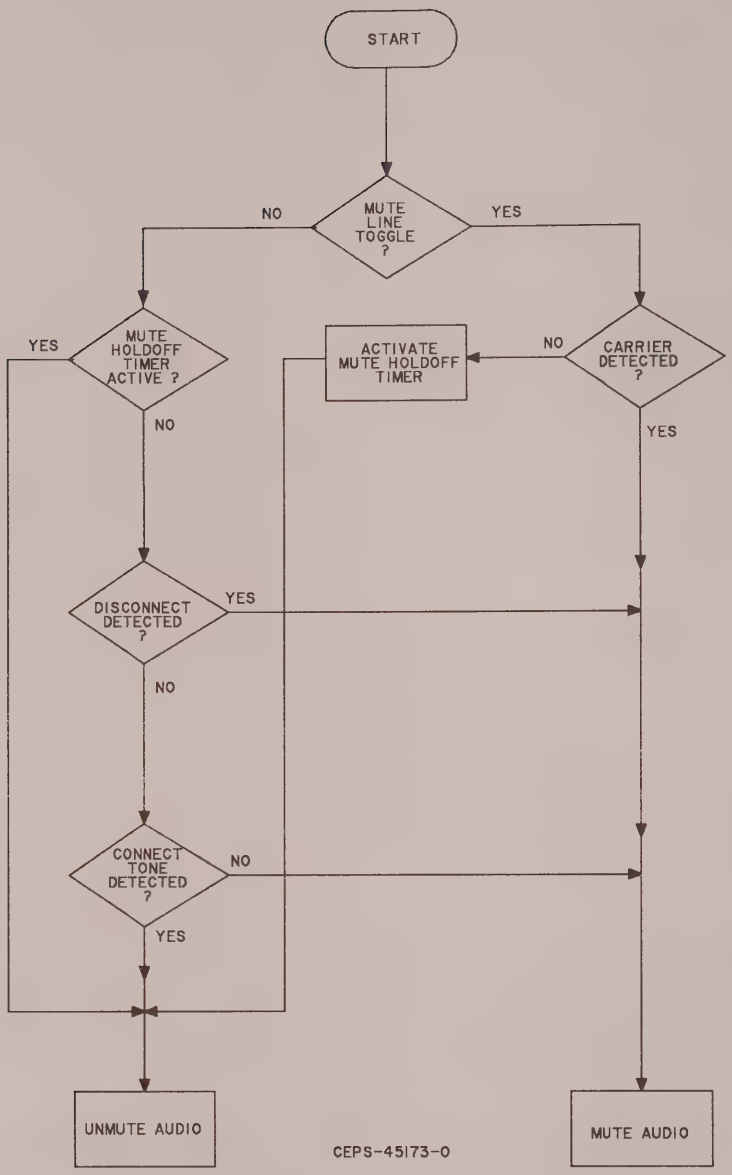


Figure 1. Logic Flow Diagram

4.2.4 Switch S1 allows the user to set several of the operating parameters of the CTD module. See Figure 2 for the switch terminal definitions. Terminals T1, T2, and T3 determine the connect tone decoding. See Table 4 for their settings. Terminals T4, T5, and T6 are not used. Terminals T7, T8, T9, and T10 determine the mute hold-off time. They are factory set for 350 ms (T7, T8, and T9 ON and T10 OFF). It should not be necessary to change their settings. Terminal G2 is not used. Terminal G3 (normally OFF) is used to aid DTMF dial decoding in telephone interconnect systems.

5. MAINTENANCE TROUBLESHOOTING

5.1 EQUIPMENT REQUIRED

15 MHz Dual-Trace Oscilloscope

5.2 BASIC OPERATIONAL TEST

Before performing the following tests check the CTD module basic operation by capturing the station with a

Table 4. Connect Tone Decoding

Connect Tone	Switch T3	Switch T2	Switch T1
0	off	off	off
1	off	off	on
2	off	on	off
3	off	on	on
4	on	off	off
5	on	off	on
6	on	on	off
7	on	on	on

trunked subscriber unit programmed with the proper connect tone. If the CTD module is detecting connect tone, the light emitting diode DS1 should be enabled and will remain lit until the subscriber unit is de-keyed.

5.3 FUNCTIONAL TESTS

To service the CTD module, unplug it, plug in the extender board, and then plug the CTD into the extender board. The shield (SH1) can be removed from the module to gain access to the TRN9917A CTD Logic Board.

Step 1. Connect Tone Dipswitch Setting. If the previous basic operational test failed, insure that the dipswitch on TRN9917A CTD Logic Board is set for the proper connect tone. Refer to switch definitions in installation section.

Step 2. Power Supply Check. If 9.6 V is not measured, check JU2 for proper position.

Step 3. Receive Data/Low-Pass Fitler Check. Capture the receiver and measure the signal at junction of JU1 (pin 2) and R1. A dc bias of approximately 3.5 V should be measured along with approximately .5 V p-p connect tone. If no signal measured, check JU1 for proper position.

Measure the signal at U1 pin 8 for the .5 V p-p connect tone biased at 3.5 V dc. If not measured, check U1 and associated circuitry.

Step 4. Center Slicer/Comparator Check. Capture the receiver and measure the signal at U2 pin 1. A 7.5 V p-p square-wave representation of the connect tone should be present. If not measured, check U2 and associated circuitry.

Step 5. Level Shifter Check. Capture the receiver and measure the signal at the collector of Q1. A 5 V p-p square-wave representation of the connect tone should be present. If not present, check Q1 and associated circuitry.

Step 6. Connect Tone Decode Indicator Check. Capture the receiver. If connect tone has been detected, the voltage on wire 7 of W1 from the logic board should go high (+ 5 V). If light emitting diode DS1 does not light, check Q2 and associated circuitry.

Step 7. Audio Mute Line Check. Capture the receiver. Light emitting diode DS1 will light when connect tone has been detected. The voltage on wire 6 of W1 should go low (0 V) allowing an open collector voltage at the collector of Q3 of approximately 8.5 V. If this does not occur check Q3 and associated circuitry.

Step 8. Rcvr Unsqu Ind Check. With station squelched, the voltage at wire 9 of W1 should be low (approximately 0 V). With station unsquelched the voltage at wire 9 of W1 should be high (approximately 5 V). If these levels are not correct, check CR3 and R24 of the filter board and insure the station receiver is operating properly.

Step 9. Mute Line Buffer Check. With station muted, the voltage at wire 11 of W1 should be approximately 3.9 V. With the station unmuted, the voltage at wire 11 of W1 should be low (approximately 0 V). If these levels are not correct check Q4 and associated circuitry and insure the MUTE line from the TIB is functioning properly.

If the previous functional tests check-out correctly (or output from the logic board is incorrect), and the CTD module continues to operate improperly, the problem is most likely on the TRN9917A CTD Logic Board. The basic operation of the micro-computer and associated circuitry should be verified using standard digital circuitry troubleshooting techniques.

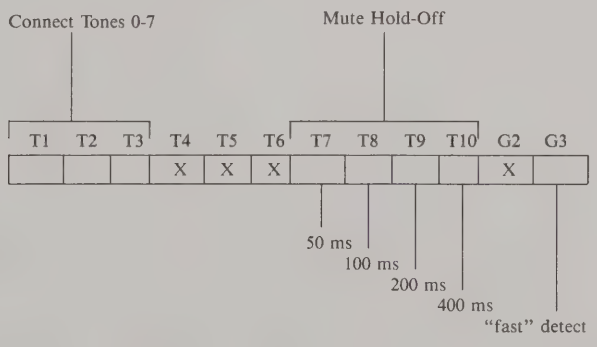


Figure 2. Switch S1 Definitions

parts list

TFN6055A CTD Filter Board PL-

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	0884637L36	.082; 100 V
C2	0811044A28	0.15; 8
C4	0811044A14	.068
C5	0811044A13	.056
C6	2111015C07	.01 +80 -20% 100 V
C7	0811051A16	0.33
C8	0811044A25	.015
C9	0811017A19	.0056; 50 V
C10,11	2311054K06	1.0 ±20 50 V
C12	2182187B22	270 pF ±10 200 V
C13, 14	2384538G06	47 ±20 20 V
C15	2111015C07	.01 +80 -20% 100 V
		diode: (see note)
CR1 thru 4	4884616A01	hot carrier
		light emitting diode; (see note)
DS1	4888245C08	red
		connector, receptacle:
JU1,2	2884729L02	male, 3-contact
		transistor: (see note)
Q1,2,3	4800869642	NPN type M9642
Q4	4800869643	PNP type M9643
		resistor, fixed: chip, ±5%; 1/8 W unless otherwise stated
R1,2,3	0611024A76	13k
R4	0611024A87	39k
R5,6	0611024A76	13k
R7	0611024A83	27k
R8	0611024A71	8200
R9	0611024A77	15k
R10	0611024A82	24k
R11	0611024A74	11k
R12	0611024A01	10
R13	0611024A87	39k
R14	0611024A01	10
R15,16	0611024A87	39k
R17	0611024A93	68k
R18	0611024A61	3300
R19	0611024A79	18k
R20	0611009A37	330 FCF 1/4 W
R22	0611024A61	3300
R23	0611024A79	18k
R24	0611024A73	10k
R25	0611024A61	3300
R26	0611024A81	22k
R27	0611024A33	220
R28	0611024A49	1000
R30,31,32	0611024A73	10k
		integrated circuit: (see note)
U1,2	5183629M09	low power quad operationalamplifi
U3	5184561L76	+5 V voltage regulator
	non-referenced items	
	0200132616	NUT, hex: 6-32x1/4x3/32x1/8" (U3)
	0300136194	SCREW, machine: 6-32x3/8" (U3)
	0784560N01	BRACKET,heat sink mounting (U3)
	0983697M01	CONTACT, receptacle: 24 used
	0984181L01	JUMPER, 2-contact: 2 used
	1483820M02	INSULATOR, heat conductive
	2684434N01	SHIELD
	4300865080	BUSHING, threaded; 6 used

TRN9887A Hardware Kit PL

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	0300125790	SCREW, locking: 4-40 × 5/16"; 2 u
	0300129675	SCREW, locking: 4-40 × 1/4"; 4 us
	4583914G01	GUIDE, card
	6483163L20	PANEL

parts list

TFN6055A CTD Filter Board — PL-10809-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	0884637L36	.082; 100 V
C2	0811044A28	0.15; 8
C4	0811044A14	.068
C5	0811044A13	.056
C6	2111015C07	.01 +80 -20% 100 V
C7	0811051A16	0.33
C8	0811044A25	.015
C9	0811017A19	.0056; 50 V
C10,11	2311054K06	1.0 ±20 50 V
C12	2182187B22	270 pF ±10 200 V
C13, 14	2384538G06	47 ±20 20 V
C15	2111015C07	.01 +80 -20% 100 V
		diode: (see note)
CR1 thru 4	4884616A01	hot carrier
		light emitting diode; (see note)
DS1	4888245C08	red
		connector, receptacle:
JU1,2	2884729L02	male, 3-contact
		transistor: (see note)
Q1,2,3	4800869642	NPN type M9642
Q4	4800869643	PNP type M9643
		resistor, fixed: chip, ±5%; 1/8 W unless otherwise stated
R1,2,3	0611024A76	13k
R4	0611024A87	39k
R5,6	0611024A76	13k
R7	0611024A83	27k
R8	0611024A71	8200
R9	0611024A77	15k
R10	0611024A82	24k
R11	0611024A74	11k
R12	0611024A01	10
R13	0611024A87	39k
R14	0611024A01	10
R15,16	0611024A87	39k
R17	0611024A93	68k
R18	0611024A61	3300
R19	0611024A79	18k
R20	0611009A37	330 FCF 1/4 W
R22	0611024A61	3300
R23	0611024A79	18k
R24	0611024A73	10k
R25	0611024A61	3300
R26	0611024A81	22k
R27	0611024A33	220
R28	0611024A49	1000
R30,31,32	0611024A73	10k
		integrated circuit: (see note)
U1,2	5183629M09	low power quad operationalamplifier
U3	5184561L76	+5 V voltage regulator
		non-referenced items
	0200132616	NUT, hex: 6-32x1/4x3/32x1/8" (U3)
	0300136194	SCREW, machine: 6-32x3/8" (U3)
	0784560N01	BRACKET,heat sink mounting (U3)
	0983697M01	CONTACT, receptacle: 24 used
	0984181L01	JUMPER, 2-contact: 2 used
	1483820M02	INSULATOR, heat conductive
	2684434N01	SHIELD
	4300865080	BUSHING, threaded; 6 used

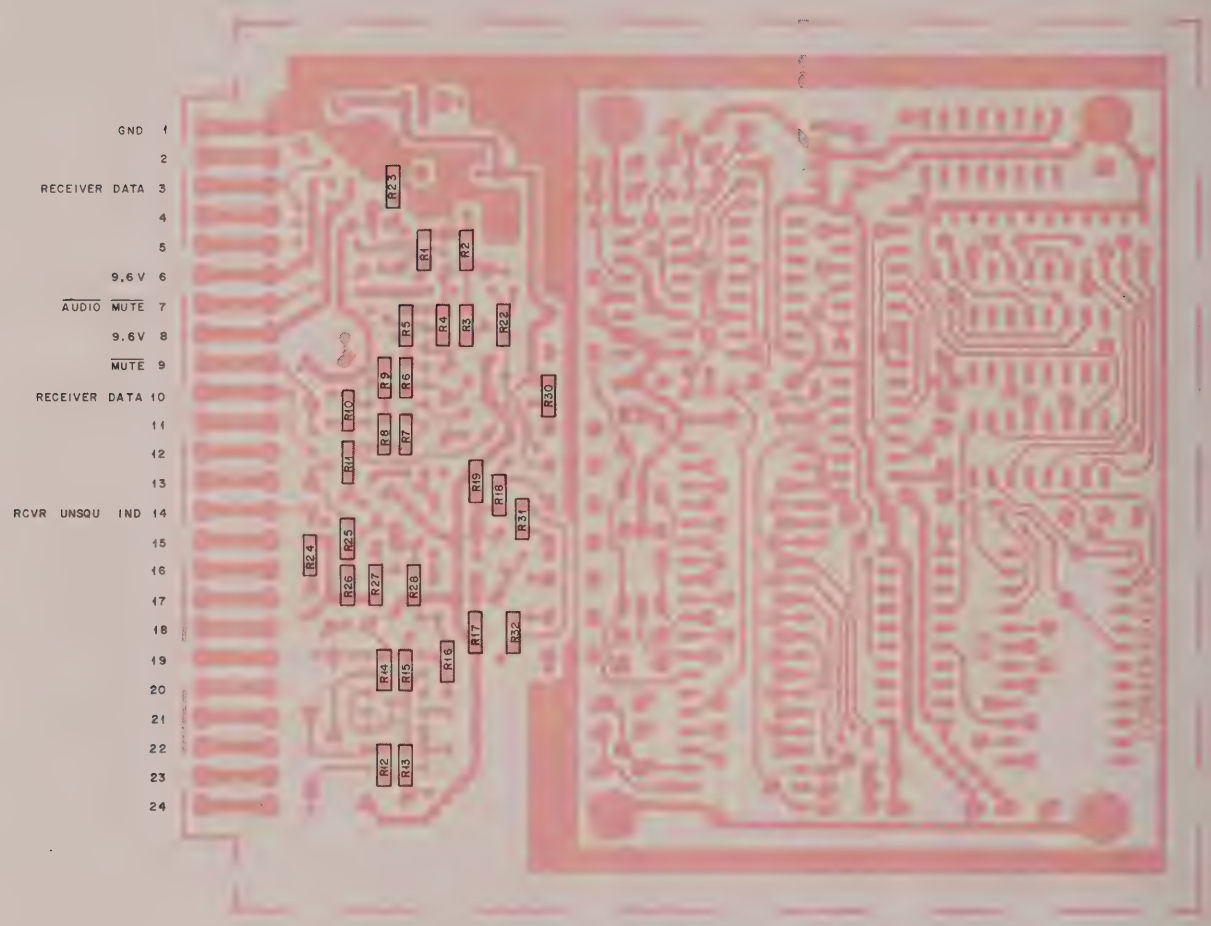
TRN9887A Hardware Kit — PL-10827-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	0300125790	SCREW, locking: 4-40 × 5/16"; 2 used
	0300129675	SCREW, locking: 4-40 × 1/4"; 4 used
	4583914G01	GUIDE, card
	6483163L20	PANEL

TRN5603B Logic Board
TRN9917A Logic Board — PL-8321-D

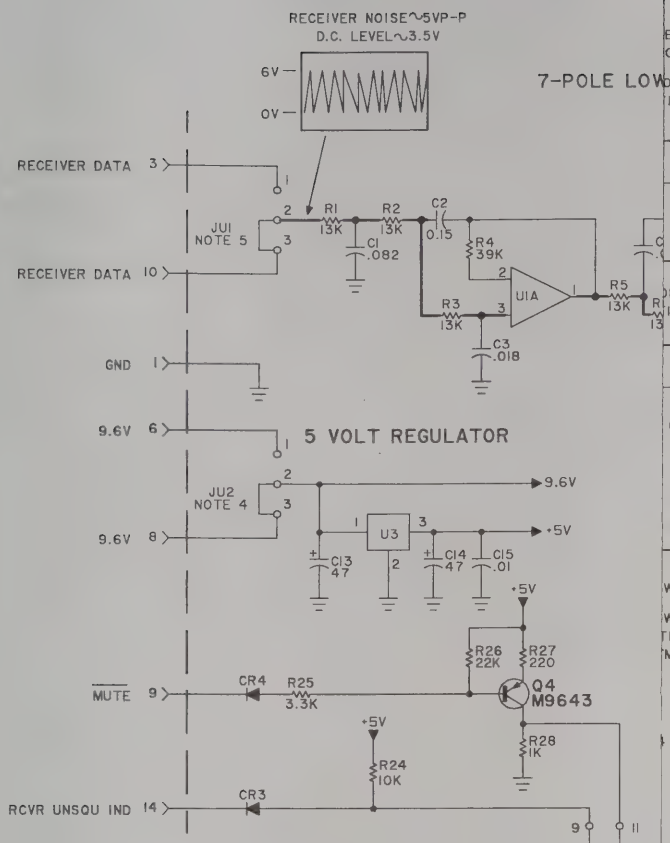
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C24	23-11013D09	4.7 uF ±10%; 20 V
C25	8-11017A15	.056 uF ±5%; 50 V
C26	23-11013D09	4.7 uF ±10%; 20 V
C27	23-11013C56	22 uF ±20%; 15 V
C28 thru 31	21-11015A07	.01 uF +80-20%; 15 V
C35, 36	21-11014H35	27 pF ±5%; 100 V
		diode: (see note)
CR9, 10	48-82392B03	silicon
		transistor: (see note)
Q12	48-869648	NPN; type M9648
Q13	48-869642	NPN, type M9642
		resistor, fixed; ±5%: 1/4 W: unless otherwise stated
R34, 35, 36	6-11009C65	4.7k
R37	6-11009E65	4.7k
R38, 39	6-11009E25	100
R40	6-11009C97	100k
R41	6-11009C77	15k
R42	6-11009C73	10k
R43	6-11009C65	4.7k
R44	6-11009C10	24
R45	6-11009E19	56
R46	6-11009C51	1.2k
R47	6-11009C47	820
R48	6-11009C23	82
R49 thru 60	p/o 51-84333G23	3.3k resistor network
R61	6-11009C51	1.2k
R62	6-11009E73	10k
R63	6-11009E65	4.7k
R64	6-11009F04	180k
R65A, 66, 69	p/o 51-84333G23	3.3k resistor network
R67, 68	6-11009E65	4.7k
		switch:
S1	40-83022M04	12 position; spst
		integrated circuit: (see note)
U1	51-83625M06	Microprocessor
U2	51-83627M03	Octal Transparent Latch
U3	51-90002H27	ROM (TRN9917A)
	51-83625N84	ROM (TRN5603B)
U4, 5	51-84561L77	Hex Buffer, 4-bit and 2-bit (3-state)
U6	51-84371K83	Quad 2-input NAND gate
U7	51-84561L04	Quad 2-input NAND gate
U8, 9	51-84561L11	Monostable Multivibrator
		crystal: (see note)
Y1	48-82611M03	3.9672 MHz
		mechanical parts
	9-82808R09	SOCKET, 24-contact
	9-84181L01	JUMPER
	14-84602K02	INSULATOR, crystal
	28-84729L02	RECEPTACLE
	29-82713M01	TERMINAL, lug; 20 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM SOLDER SIDE

SOLDER SIDE BD-CEPS-45165-0 (REV)
OL-CEPS-45245-0



ERWISE INDICATED, RESISTOR VALUES ARE IN OHMS
OR VALUES ARE IN MICROFARADS.

ONNECT TONE DECODER FILTER BOARD IC TYPE
IONS ARE AS FOLLOWS:

DESCRIPTION	VCC	GND
QUAD OP AMP	4	11
QUAD OP AMP	4	11
5 VOLT REGULATOR	1	2

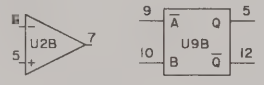
ONNECT TONE DECODER LOGIC BOARD IC TYPES
IONS ARE AS FOLLOWS:

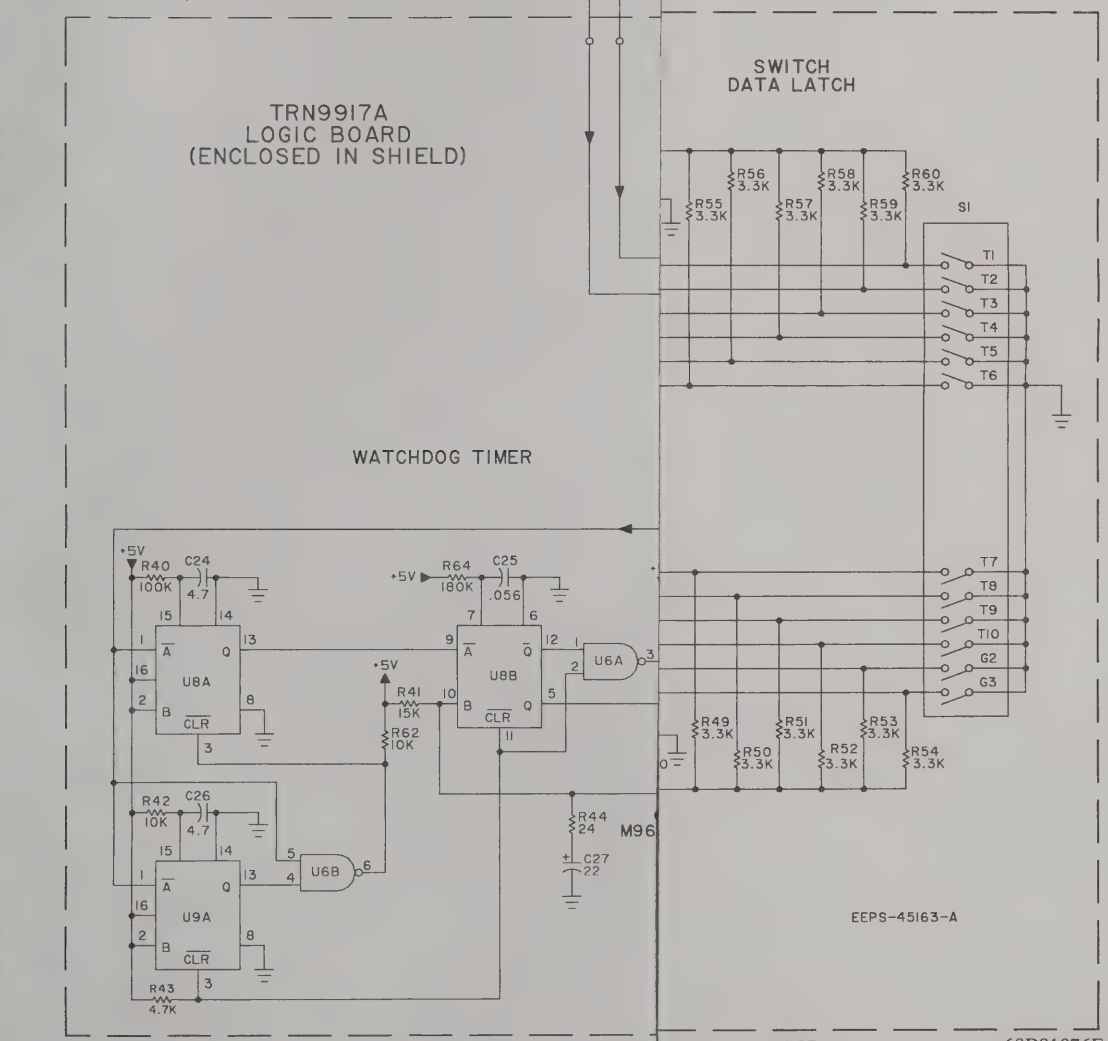
DESCRIPTION	VCC	GND
MICRO-COMPUTER	21	1
OCTAL TRANSPARENT LATCH	20	10
ROM	24	12
HEX BUFFER (3-STATE)	16	8
QUAD 2-INPUT NAND GATE	14	7
MONOSTABLE MULTIVIBRATOR	16	8

WN IN SATELLITE RECEIVER POSITION.

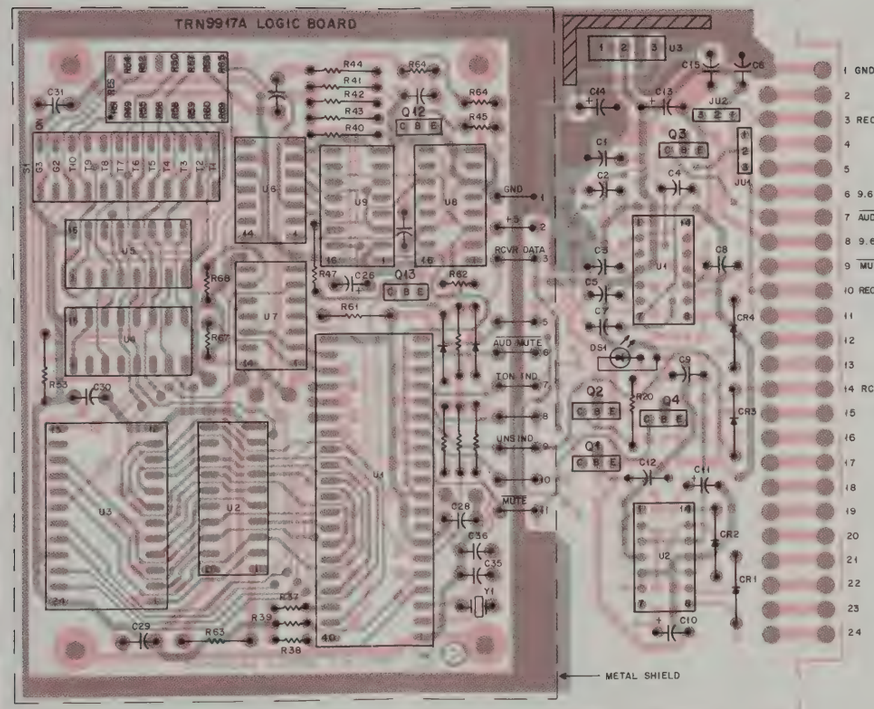
WN IN STANDARD POSITION.
TION FOR INSTALLATION IN QRN4313A
M BASE STATION INTERCONNECT BOARD.

SPARE IC'S





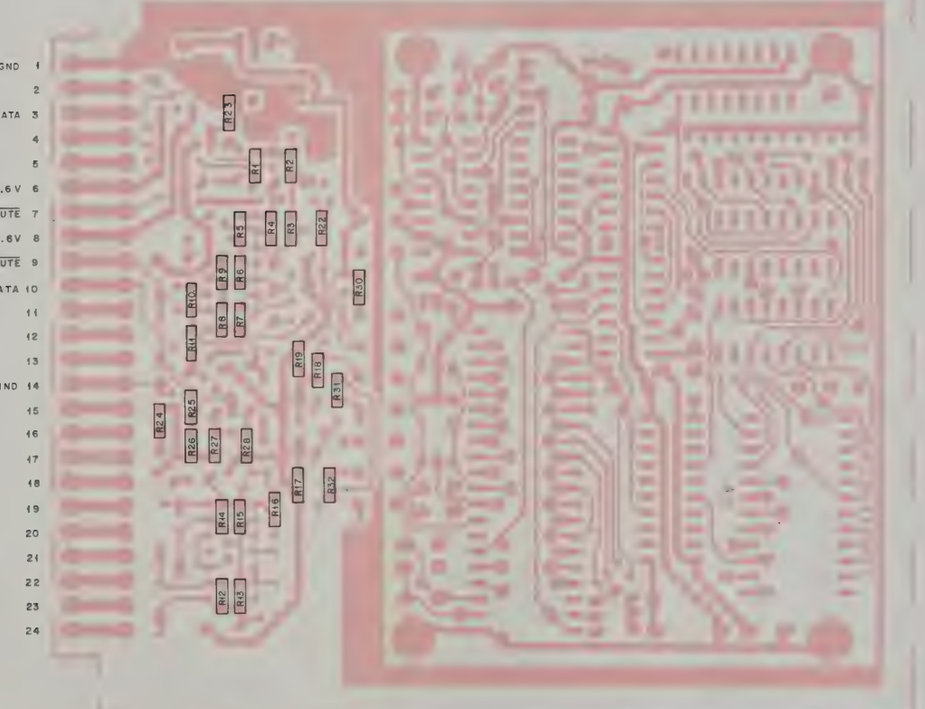
TFN6055A FILTER BOARD



SHOWN FROM COMPONENT SIDE

TRANSISTOR
PIN DETAIL
Q1 THRU Q4

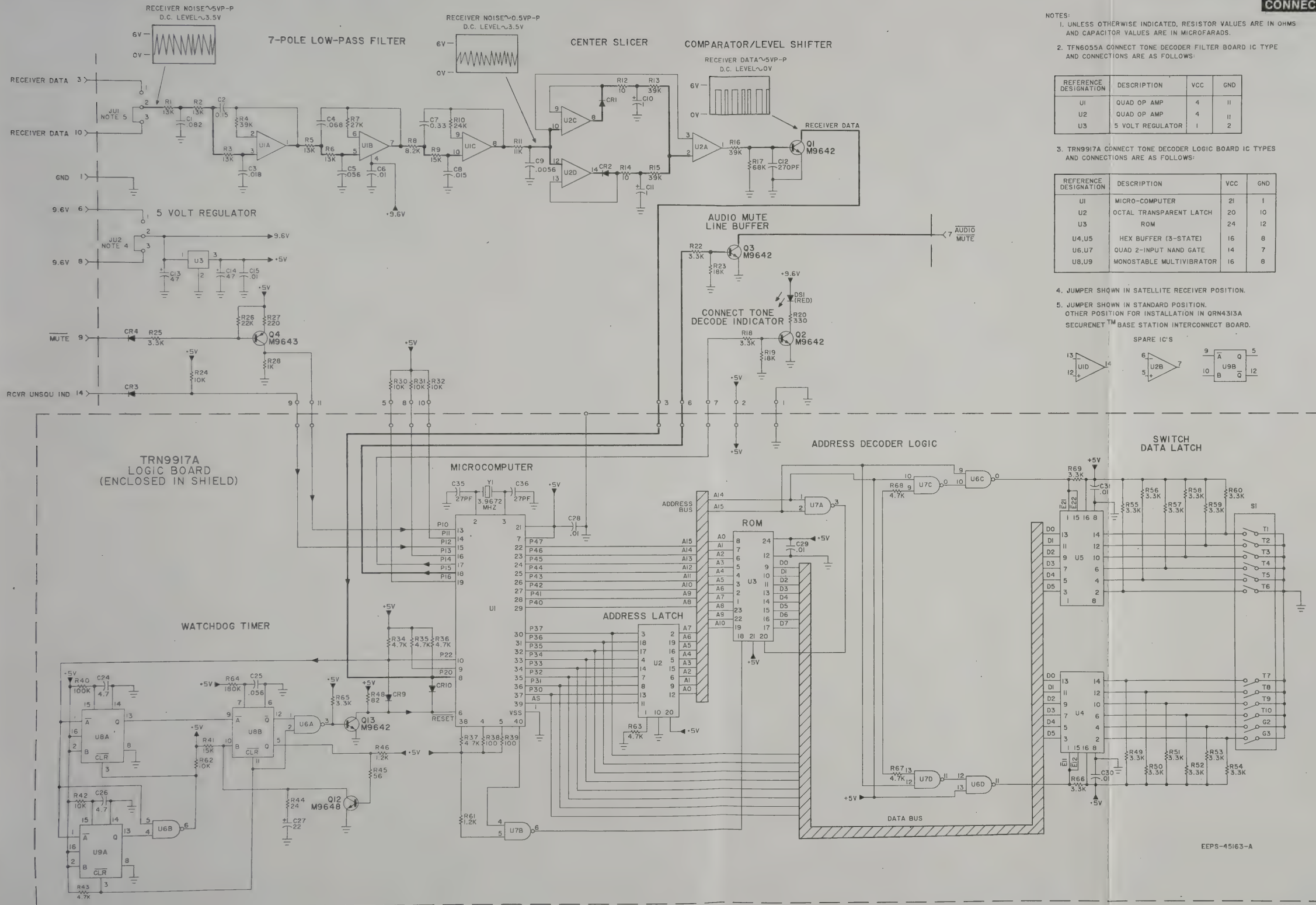
C B E



SHOWN FROM SOLDER SIDE

COMPONENT SIDE - BD-CEPS-45164-O
SOLDER SIDE - BD-CEPS-45165-O
OL-CEPS-45166-O

SOLDER SIDE - BD-CEPS-45165-O (REV)
OL-CEPS-45245-O



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
2. TFN6055A CONNECT TONE DECODER FILTER BOARD IC TYPE AND CONNECTIONS ARE AS FOLLOWS:

REFERENCE DESIGNATION	DESCRIPTION	VCC	GND
U1	QUAD OP AMP	4	11
U2	QUAD OP AMP	4	11
U3	5 VOLT REGULATOR	1	2

3. TRN9917A CONNECT TONE DECODER LOGIC BOARD IC TYPES AND CONNECTIONS ARE AS FOLLOWS:

REFERENCE DESIGNATION	DESCRIPTION	VCC	GND
U1	MICRO-COMPUTER	21	1
U2	OCTAL TRANSPARENT LATCH	20	10
U3	ROM	24	12
U4,U5	HEX BUFFER (3-STATE)	16	8
U6,U7	QUAD 2-INPUT NAND GATE	14	7
U8,U9	MONOSTABLE MULTIVIBRATOR	16	8

4. JUMPER SHOWN IN SATELLITE RECEIVER POSITION.
5. JUMPER SHOWN IN STANDARD POSITION. OTHER POSITION FOR INSTALLATION IN ORN4313A SECURENET™ BASE STATION INTERCONNECT BOARD.

SPARE IC'S

MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUALS AFFECTED:

68P81025E50-H	*Micor* Base and Repeater Stations
68P81034E25-C	*Securenet Digital Voice Protection Systems Micor* Base and Repeater Stations
68P81039E45-A	*Spectra-TAC* Total Area Coverage Voting and Satellite Receivers
68P81039E55-A	*Micor* Base and Repeater Stations
68P81063E10-B	Link Receiver Options

REVISION DETAILS:

Two new options, the C12AC and C12AD UHF Preamplifier, have been added. Their model complement is as follows:

C12AC *Micor* UHF Preamplifier Model Complement

Kit No.	Description
TLE2461A	UHF Preamplifier (406-450 MHz) or
TLE2463A	UHF Preamplifier (450-512 MHz)
TKN8544A	Preamplifier Cable

C12AD *Spectra-TAC* UHF Preamplifier Model Complement

Kit No.	Description
TLE2461A	UHF Preamplifier (406-450 MHz) or
TLE2463A	UHF Preamplifier (450-512 MHz)
TKN8545A	Preamplifier Cable

Add the C12AC and C12AD options to the option chart on page xv of manual 68P81025E50-H and add the attached section 68P81121E73-O behind the RECEIVER tab. Note that the new preamplifier replaces the one shown on the RF and I-F board schematic diagram shown on PEPS-17752 behind the RECEIVER tab.

Add the C12AC and C12AD options to the option chart on page xi of manual 68P81034E25-C and add the attached section 68P81121E73-O behind the RECEIVER tab. Note that the new preamplifier replaces the one shown on the RF and I-F board schematic diagram shown on PEPS-17752 behind the RECEIVER tab.

In manual 68P81039E45-A, add the attached section 68P81121E73-O behind the RECEIVER RF & I-F tab. Note that the new preamplifier replaces the one shown on the RF and I-F board schematic diagram shown on PEPS-24478 behind the RECEIVER RF & I-F tab.

Add the C12AC and C12AD options to the option chart on page xiii of manual 68P81039E55-A and add the attached section 68P81121E73-O behind the RECEIVER tab. Note that the new preamplifier replaces the one shown on the RF and I-F board schematic diagram shown on PEPS-17752 behind the RECEIVER tab.

In manual 68P81063E10-H, add the attached section 68P81121E73-O behind the 406-512 MHz RECEIVER tab. Note that the new preamplifier replaces the one shown on the RF and I-F board schematic diagram shown on PEPS-24478 behind the 406-512 MHz RECEIVER tab.

ATTACHMENT:

Model TLE2461A and TLE2463A UHF Preamplifiers.....68P81121E73-O

MOTOROLA INC.
Communications
Sector

UHF PREAMPLIFIER
MODEL TLE2461A (406-450 MHz)
MODEL TLE2463A (450-512 MHz)

1. INTRODUCTION

The TLE2461A and TLE2463A UHF Preamplifiers are optional accessories that extend the useful operating range of the receiver by improving receiver sensitivity. This manual describes the circuitry, hardware, theory of operation, and maintenance of the preamplifiers.

2. MODEL COMPLEMENT

TLE2461A Model Breakdown

Kit No.	Description
TLE5837A	UHF Preamplifier Board (406-450 MHz)
TRN7043A	Preamplifier Hardware Kit

TLE2463A Model Breakdown

Kit No.	Description
TLE5571A	UHF Preamplifier Board (450-512 MHz)
TRN7043A	Preamplifier Hardware Kit

3. DESCRIPTION

The preamplifier contains input filtering and matching, a single stage low noise bipolar transistor, and control and protection circuitry. The preamplifier printed circuit board is mounted in a metal housing. A rear cover with an angled mounting slot is fastened to the back of the chassis housing by eight screws. This rear cover provides easy access to the printed circuit board and holds the preamplifier to the base station. The housing also contains an input connector labeled IN (J102) and an output connector labeled OUT (J101). Preamplifier power and control is connected to the KEYED A- and A+ line, via two feed-through capacitors.

4. THEORY OF OPERATION
(Refer to Schematic Diagram.)

4.1 The antenna is connected to the input (J102) of the preamplifier. The received signal from the antenna travels through a high pass filter into transistor Q125, a low noise bipolar class A rf amplifier. Next, the signal travels through the output network which matches Q125 to 50 ohms output impedance. This output (J101) is connected to the rf input of the receiver. Q126 is a current source which supplies current to Q125.

4.2 Transistors Q127 and Q128 are switches which turn the rf preamplifier on or off. Some applications utilize this feature to turn off the preamplifier during transmit. Otherwise, the Keyed A- and A+ feed-through capacitors are jumpered together and connected to A+.

4.3 When the transmit turn-off feature is used (jumper between Keyed A- and A+ removed), the Keyed A- feed-through capacitor is low (0 V) during transmit. Transistor Q128 is turned off, thus removing bias from Q125 and Q126. Q127 is turned on, which forward biases CR125 and allows rf signals to pass through CR125 and CR128 to ground. This prevents high level rf signals from damaging Q125 during transmit.

PERFORMANCE SPECIFICATIONS

Operating Frequency	TLE2461A 406-450 MHz TLE2463A 450-512 MHz
Power Gain	10 dB min.
Noise Figure	3.5 dB max.
Temperature Range	-30°C to +60°C
Size	12.70cm (5")H × 5.72cm (2-1/4")W × 2.54cm (1")D
Termination Connectors	Female Phono

5. MAINTENANCE

This section provides troubleshooting procedures for the preamplifier. Poor sensitivity and improper voltage levels are generally the result of a malfunction. The following procedure checks the preamplifier for poor sensitivity.

Step 1. Measure receiver sensitivity without the preamplifier.

Step 2. If receiver sensitivity is within specifications, check rf cables for excessive loss.

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68P81121E73-O
8/8/88-UP

Step 3. If no excessive loss can be detected, check the dc voltages provided in Table 1. It lists proper voltage levels for components on the circuit board.

Table 1. DC Voltage Levels

Where Measured	Receive Mode	Transmit Mode
A+ Feedthru Capacitor	+13.8 V	+13.8 V
Keyed A- Feedthru Capacitor	+13.8 V	0 V
Emitter Q128	+9.5 V	0 V
Collector Q127	0 V	+10 V
Collector Q125	+8.7 V	0 V
Cathode CR125	0 V	+9 V

NOTE

Transmit mode voltages will be present only when the Keyed A– and Keyed A+ feed-through capacitors are NOT jumpered together and the preamplifier is turned off during transmit.

Step 4. If the dc voltage levels are correct, replace Q125.

parts list

TLE5837A Preamplifier Board (406-450 MHz)
TLE5571A Preamplifier Board (450-512 MHz) PL-88

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: pF ±5%; 100 V unless otherwise stated
C125	2111014H21	6.8 ±0.5 (TLE5571A)
C125	2111014H25	10 ±0.5 (TLE5837A)
C126	2111014H13	3.3 ±0.25 (TLE5571A)
C126	2111014H18	5.1 ±0.25 (TLE5837A)
C127	2111014H23	8.2 ±0.5 (TLE5571A)
C127	2111014H25	10 ±0.5 (TLE5837A)
C128	2111022H21	13; 50 V
C129	2111014H13	3.3 ±0.25
C130	2111014H36	30
C131	2111022G42	33; 50 V (TLE5571A)
C131	2111022G45	43; 50 V (TLE5837A)
		diode: (see note)
CR125	4883510F04	silicon
		coil, rf:
L125, 126	2411030C05	coded GRN
L127	2482723H28	choke: 290 nH
L129	2483884G07	2.5 turns
		transistor: (see note)
Q125	48869870	NPN; type M9870
Q126, 127	48869642	PNP; type M9643
Q128	48869642	NPN; type M9642
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R125	611009A49	1k
R126	611009A69	6.8k
R127	611009A83	27k
R128	611009A27	120
R132	611009A13	33
R133	611009A25	100
R134	611009A73	10k
R135, 136	611009A65	4.7k
R138	611009A39	390

TRN7043A Preamplifier Hardware PL-110

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C132, 133	21-861219	1000 uF +100-0%
		connector, receptacle:
J101, 102	9-83663C01	female, single contact
		connector, plug:
P101	28-82875N01	male, single contact (phone)
P102	28-84282D01	male, single contact
		mechanical parts
	5-82050H04	EYELET; 2 used
	30-83794C01	CABLE, coaxial (WHT); 33" used
	1-80722E98	Assembly Bracket Phono & Feedthru; includes: J101, 102 and C132, 133
	4-83755H01	WASHER, shoulder; 2 used
	15-83220P01	HOUSING, preamplifier
	2-131435	NUT, 4-40 × 1/4 × 3/32"; 2 used
	3-134186	SCREW, tapping: 6-32 × 5/16"
	3-134268	SCREW, tapping: 4-40 × 9/16"; 2 used
	3-136891	SCREW, tapping: 4-24 × 1/4"; 8 used
	4-691205	WASHER, insulator shoulder; 2 used
	15-83221P01	COVER, preamplifier
	42-10217A02	STRAP, tie: .091 × 3.62"; 5 used
	30-10286C57	JUMPER, 0.38"
	29-84249N01	TERMINAL, receptacle; 2 used

TKN8544A Receiver Cable (Micor™ Applications) PL-110

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	0180775B69	ASSEMBLY, cable, includes:
	2882331G02	PLUG, coaxial; 2 used
	3084173E01	CABLE, coaxial; 12" used
	0300139999	SCREW, tapping: 6-19 × 3/8"; 2 used

TKN8545A Receiver Cable (Spectra-TAC™ Applications) PL-110

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	018022E999	ASSEMBLY, cable, includes:
	2882331G02	PLUG, coaxial; 2 used
	3084173E01	CABLE, coaxial; 26" used
	0300139616	SCREW, tapping: 6-32 × 3/8"; 2 used

A/63A UHF RF PREAMPLIFIER

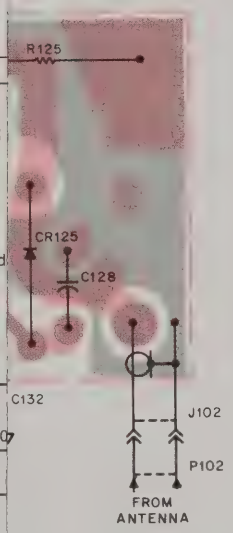
SCHEMATIC DIAGRAM, CIRCUIT BOARD DETAIL & PARTS LISTS

NOTES:

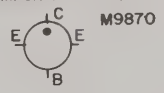
1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in picofarads.
2. Values for capacitors C125, C126, C127, and C131 are as follows:

Ref. Desig.	Value (pF) TLE5571A	TLE5837A
C125	6.8	10
C126	3.3	5.1
C127	8.2	10
C131	33	43

3. Jumper JU1 is removed and keyed A- is connected to turn preamplifier off during transmit. (*Micor* applications only, not applicable to *Spectra-TAC* receivers).



TRANSISTOR BASE DETAILS (SHOWN FROM COMPONENT SIDE)



ALL OTHERS

Step 3. If no excessive loss can be detected, check the dc voltages provided in Table 1. It lists proper voltage levels for components on the circuit board.

Table 1. DC Voltage Levels

Where Measured	Receive Mode	Transmit Mode
A+ Feedthru Capacitor	+13.8 V	+13.8 V
Keyed A- Feedthru Capacitor	+13.8 V	0 V
Emitter Q128	+9.5 V	0 V
Collector Q127	0 V	+10 V
Collector Q125	+8.7 V	0 V
Cathode CR125	0 V	+9 V

NOTE

Transmit mode voltages will be present only when the Keyed A– and Keyed A+ feed-through capacitors are NOT jumpered together and the preamplifier is turned off during transmit.

Step 4. If the dc voltage levels are correct, replace Q125.

TLE2461A/63A UHF RF PREAMPLIFIER

SCHEMATIC DIAGRAM, CIRCUIT BOARD DETAIL & PARTS LISTS

parts list

TLE5837A Preamplifier Board (406-450 MHz)
TLE5571A Preamplifier Board (450-512 MHz) PL-8861-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: pF ±5%; 100 V unless otherwise stated
C125	2111014H21	6.8 ±0.5 (TLE5571A)
C125	2111014H25	10 ±0.5 (TLE5837A)
C126	2111014H13	3.3 ±0.25 (TLE5571A)
C126	2111014H18	5.1 ±0.25 (TLE5837A)
C127	2111014H23	8.2 ±0.5 (TLE5571A)
C127	2111014H25	10 ±0.5 (TLE5837A)
C128	2111022H21	13; 50 V
C129	2111014H13	3.3 ±0.25
C130	2111014H36	30
C131	2111022G42	33; 50 V (TLE5571A)
C131	2111022G45	43; 50 V (TLE5837A)
		diode: (see note)
CR125	4883510F04	silicon
		coil, rf:
L125, 126	2411030C05	coded GRN
L127	2482723H28	choke: 290 nH
L129	2483884G07	2.5 turns
		transistor: (see note)
Q125	48869870	NPN; type M9870
Q126, 127	48869642	PNP; type M9643
Q128	48869642	NPN; type M9642
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R125	611009A49	1k
R126	611009A69	6.8k
R127	611009A83	27k
R128	611009A27	120
R132	611009A13	33
R133	611009A25	100
R134	611009A73	10k
R135, 136	611009A65	4.7k
R138	611009A39	390

TRN7043A Preamplifier Hardware PL-11073-O

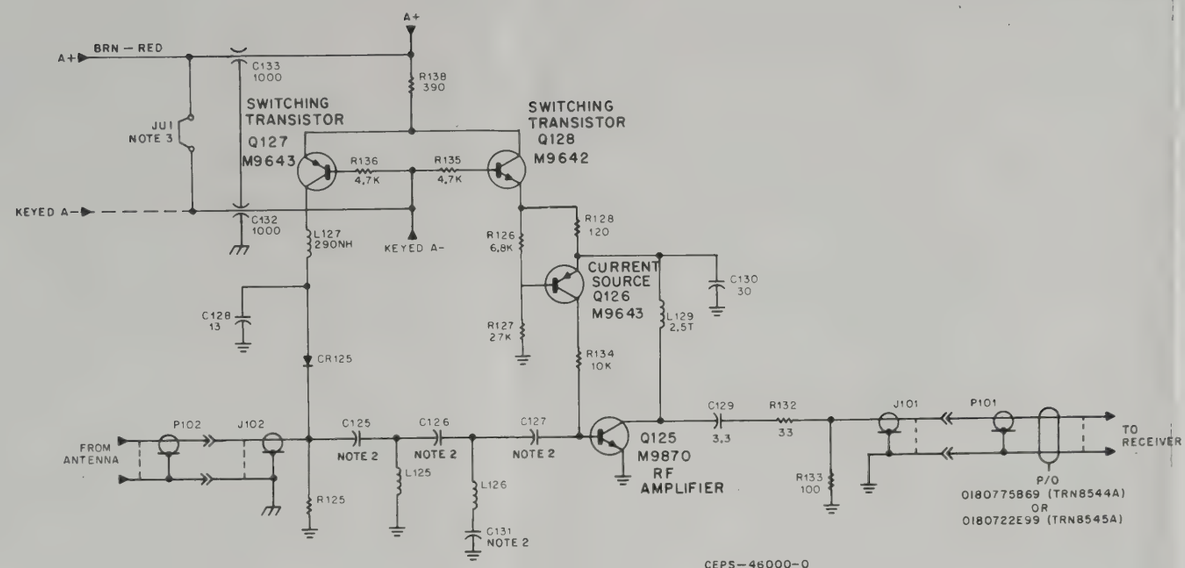
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C132, 133	21-861219	1000 uF +100-0%
		connector, receptacle:
J101, 102	9-83663C01	female, single contact
		connector, plug:
P101	28-82875N01	male, single contact (phone)
P102	28-84282D01	male, single contact
		mechanical parts
	5-82050H04	EYELET; 2 used
	30-83794C01	CABLE, coaxial (WHT); 33" used
	1-80722E98	Assembly Bracket Phono & Feedthru; includes: J101, 102 and C132, 133
	4-83755H01	WASHER, shoulder; 2 used
	15-83220P01	HOUSING, preamplifier
	2-131435	NUT, 4-40 × 1/4 × 3/32"; 2 used
	3-134186	SCREW, tapping: 6-32 × 5/16"
	3-134268	SCREW, tapping: 4-40 × 9/16"; 2 used
	3-136891	SCREW, tapping: 4-24 × 1/4"; 8 used
	4-691205	WASHER, insulator shoulder; 2 used
	15-83221P01	COVER, preamplifier
	42-10217A02	STRAP, tie: .091 × 3.62"; 5 used
	30-10286C57	JUMPER, 0.38"
	29-84249N01	TERMINAL, receptacle; 2 used

TKN8544A Receiver Cable (Micor™ Applications) PL-11074-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	0180775B69	ASSEMBLY, cable, includes:
	2882331G02	PLUG, coaxial; 2 used
	3084173E01	CABLE, coaxial; 12" used
	0300139999	SCREW, tapping: 6-19 × 3/8"; 2 used

TKN8545A Receiver Cable (Spectra-TAC™ Applications) PL-11075-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	018022E999	ASSEMBLY, cable, includes:
	2882331G02	PLUG, coaxial; 2 used
	3084173E01	CABLE, coaxial; 26" used
	0300139616	SCREW, tapping: 6-32 × 3/8"; 2 used



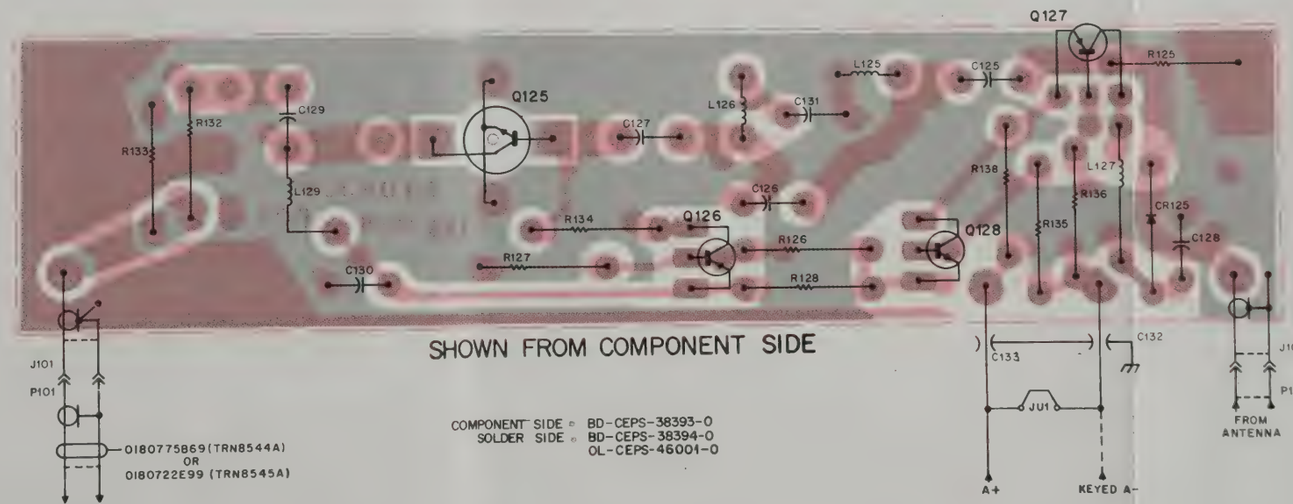
CEPS–46000–O

NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in picofarads.
2. Values for capacitors C125, C126, C127, and C131 are as follows:

Ref. Desig.	Value (pF) TLE5571A	TLE5837A
C125	6.8	10
C126	3.3	5.1
C127	8.2	10
C131	33	43

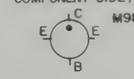
3. Jumper JU1 is removed and keyed A- is connected to turn preamplifier off during transmit. (*Micor* applications only, not applicable to *Spectra-TAC* receivers).



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE = BD-CEPS-38393-O
SOLDER SIDE = BD-CEPS-38394-O
OL-CEPS-46001-O

TRANSISTOR BASE DETAILS (SHOWN FROM COMPONENT SIDE)



ALL OTHERS

SPECTRA TAC
TOTAL AREA COVERAGE

VOTING AND SATELLITE RECEIVERS

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Communications Division

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6/12/81-UP

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 900 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area and district service managers and district representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender" ® and "Vibrasponder" ® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, PROMs, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, PROMs, code plugs, *Vibrasender* and *Vibrasponder* resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used; and should include any serial numbers stamped on the components being replaced.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics Inc.
Communications Group Parts Dept.
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7322
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8600
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road,
Parma, Ohio 44130
Phone: 216-267-2210
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-447-4000
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
P.O. Box 85036
San Diego, California 92138
Phone: 714-578-2222
TWX: 910-335-1634

GULF STATES AREA PARTS
8550 Katy Freeway
Suite 128
Houston, Texas 77024
Phone: 713-932-8955

SOUTHWESTERN AREA PARTS
P.O. Box 34290
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-241-2151
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
P.O. Box 368
Decatur, Georgia 30031
Phone: 504-981-9800
TWX: 810-766-0876

5.3 CANADIAN ORDERS

MOTOROLA LTD.
National Parts Department
3125 Steeles Avenue East
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-492-2713
Telex: 065-25191

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC. OR MOTOROLA AMERICAS, INC.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443 or 722424
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS, PROMs, AND RESONANT REED ORDERS

ALL MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131

PERFORMANCE SPECIFICATIONS

POWER SUPPLY	Input: 120/240 V ac, 50-60 Hz or 13.8 V dc Output: 13.8 and 9.6 V dc Optional emergency battery operation with automatic switchover, emergency power alert, and battery recharge.
RECEIVER FREQUENCY BANDS	Voting Receivers: 132-174 MHz, 406-420 MHz, 450-512 MHz, and 806-821 MHz Satellite Receivers: 25-50 MHz, 72-76 MHz, 132-174 MHz, 406-420 MHz, 450-512 MHz & 806-821 MHz (Refer to appropriate Receiver RF & IF section for detailed receiver specifications for each band.)
OUTPUT LINE IMPEDANCE	600 ohms, balanced
LINE AUDIO CHARACTERISTICS	Output: Adjustable, +11 dBm maximum Response: +1, -3 dB from 300 to 3000 Hz Distortion: 3% at 1000 Hz Hum & Noise: -55 dB
LOCAL SPEAKER AUDIO CHARACTERISTICS	Output Available: 1/2 watt at 16 ohms Response: +2, -8 dB from 300 to 3000 Hz Distortion: 5% at 1000 Hz Hum & Noise: -50 dB
TIMING	Carrier Squelch Receiver: Audio is present 40 milliseconds after receipt of a 20 dB quieting signal. Coded Squelch Receiver: Audio is present upon operation of receiver's "Private-Line" squelch switching circuit.
DIMENSIONS	5-1/4" x 19" rack panel
ENCLOSURES	Voting Receivers: Indoor 30-inch cabinet holds up to three receivers, a multicoupler, and optional batteries. Satellite Receivers: None

EPS-17862-B

MOTOROLA

MODEL CHART

FOR

SPECTRA TAC AND IMTS VOTING RECEIVERS: 132-174, 406-420, 450-512, AND 806-821 MHz

SATELLITE RECEIVERS: 25-50, 72-76, 132-174, 406-420, 450-512, AND 806-821 MHz

CODE:

[X] - ONE ITEM SUPPLIED

[/] - ONE ITEM SUPPLIED DEPENDENT ON FREQUENCY RANGE

RECEIVER MODEL VARIATIONS

C03RTB1100A

- 5 = DC VOTING RECEIVER
- 0 = NON-VOTING RECEIVER
- 6 = TONE VOTING RECEIVER
- 1 = CARRIER SQUELCH
- 3 = TONE-CODED SQUELCH
- 4 = DIGITAL-CODED SQUELCH
- 1 = 25-50 MHz
- 2 = 72-76 MHz
- 3 = 132-174 MHz
- 4 = 406-420 AND 450-512 MH.
- 5 = 806-821 MHz
- C = WITH CABINET
- N = LESS CABINET

MODEL	DESCRIPTION	ITEM	DESCRIPTION
		TLN1961A	RECEIVER HOUSING ASSEMBLY
		TRN6825A	RECEIVER SHIELD KIT
		TPN1158A	POWER SUPPLY
		TRN8805	AUDIO CONTROL MODULE
		TLB8851B	RF-IF DECK (25-30 MHz)
		TLB8852B	RF-IF DECK (30-36 MHz)
		TLB8853B	RF-IF DECK (36-42 MHz)
		TLB8854B	RF-IF DECK (42-50 MHz)
		TLD8271B	RF-IF DECK (132-142 MHz)
		TLD8272B	RF-IF DECK (132-150.8 MHz)
		TLD8273B	RF-IF DECK (150.8-162 MHz)
		TLD8274B	RF-IF DECK (162-174 MHz)
		TRB1201BA	RF-IF DECK (406-420 MHz)
		TRB1202BA	RF-IF DECK (450-470 MHz)
		TRB1204BA	RF-IF DECK (470-494 MHz)
		TRB1205BA	RF-IF DECK (494-512 MHz)
		K1009A	CHANNEL ELEMENT
		K1005A	CHANNEL ELEMENT
		TRN6064A	SHIELD ASSEMBLY
		TRN6065A	ENCODER MODULE
		TRN6605A	DIGITAL "PRIVATE-LINE" MODULE
		TRN6083A	CODE PLUG
		TLN8381A	TONE "PRIVATE-LINE" MODULE
		TRN6044A	"VIBRASPONDER" RESONANT REED
		TRN9035A	CABINET
		TRN4332A	CABINET HARDWARE KIT
		TRN4333A	SHIELD, RF IF (25-50 AND 72-76 MHz)
		TRN8540A	SHIELD, RF IF (132-174 MHz)
		TRN9036A	SHIELD, RF IF (406-512 MHz)
		TLC6112B	RECEIVER/SERVICE AIDS
		TRN6448A	RF-IF DECK 72-76 MHz
		TRN9039A	HARDWARE KIT
		TRN9040A	AUDIO CONTROL MODULE
		TRF1011C	800 MHz RECEIVER
		TLN9998A	ANTENNA CABLE KIT
		TRN9999A	ANTENNA CABLE KIT
		TLN5944A	RF SELECTOR MODULE
		TPN8400A	RF SELECTOR MODULE
		TRN1024A	SHIELD, RF IF (806-821 MHz)
		TLN5960A	LINE CORD KIT
		TRN5964A	LINE CORD KIT
		TRN5966A	CARD PULLER
	CARRIER SQUELCH MODELS		
C03RTB1108C	VOTING RECEIVER (132-174 MHz)	X X X X	X X X X

"SPECTRA TAC" RECEIVER OPTIONS

OPTION	ADD	DELETE	APPLICABILITY
C621AA	K1006A Channel Element TLN4440A AFC Amplifier Kit	K1005A Channel Element	All C03RTB and N03RTB series models.
C12A	RF Preamplifier TLD8421B (130-150.8 MHz) or TLD8422B (150.8-174 MHz) TKN6807A Cable Kit	Nothing	All C03RTB and N03RTB series models
C12A	RF Preamplifier TLE8191A (406-450 MHz) or TLE8192A (450-512 MHz) TKN6812A Cable Kit	Nothing	All C04RTB and N04RTB series models
C27A	THN6303A 46-Inch Outdoor Cabinet TLN4862A Vents	THN6141A 30-Inch Cabinet	All C03RTB, C04RTB & C05RTB series models.
C36A	THN6058A 70-Inch Outdoor Cabinet TLN6892A Rain Shield	THN6141A 30-Inch Cabinet	All C03RTB, C04RTB & C05RTB series models.
C28A	TPN1141A Emergency Power Kit	Nothing	All C03RTB, C04RTB & C05RTB series models.
C32A	Nothing	TPN1158A Power Supply	All models.
C76A	Nothing	TRN6085B Encoder Module	All C03RTB, C04RTB & C05RTB series models.
C87A	TRN6448A Hardware Kit	THN6141A 30-Inch Cabinet TRN6337A Hardware Kit	All C03RTB, C04RTB & C05RTB series models.
C102A	Add one high band carrier squelch voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TLD8271A (132-142 MHz) or TLD8272A (142-150.8 MHz) or TLD8273A (150.8-162 MHz) or TLD8274A (162-174 MHz) K1005A Channel Element TRN6334A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids	Nothing	Model C03RTB1108.
C102A	Add one high band tone PL voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TLD8271A (132-142 MHz) or TLD8272A (142-150.8 MHz) or TLD8273A (150.8-162 MHz) or TLD8274A (162-174 MHz) K1005A Channel Element TRN6334A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6083A Tone PL Module TLN8381A "Vibrasponder" Reed	Nothing	Model C03RTB3108.

EPS-26627-O

OPTION	ADD	DELETE	APPLICABILITY
C102A	Add one high band digital receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TLD8271A (132-142 MHz) or TLD8272A (142-150.8 MHz) or TLD8273A (150.8-162 MHz) or TLD8274A (162-174 MHz) K1005A Channel Element TRN6334A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6082A Digital PL Module TRN6005A Code Plug	Nothing	Model C03RTB6108.
C105AA	TLN1717A Receiver Service Kit	Nothing	All models.
C117A	Add one UHF carrier squelch voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TRE1201B (406-420 MHz) or TRE1203B (450-470 MHz) or TRE1204B (470-494 MHz) or TRE1205B (494-512 MHz) KXN1024A Channel Element TRN8540A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids		Model C04RTB1108.
C117A	Add one UHF tone PL voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TRE1201B (406-420 MHz) or TRE1203B (450-470 MHz) or TRE1204B (470-494 MHz) or TRE1205B (494-512 MHz) KXN1024A Channel Element TRN8540A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6083A Tone PL Module TLN8381A "Vibrasponder" Reed	Nothing	Model C04RTB3108.

"SPECTRA TAC" RECEIVER OPTIONS (Cont'd.)

OPTION	ADD	DELETE	APPLICABILITY
C117A	Add one UHF digital PL voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module TRN6085B Encoder Module RF-IF Deck (select freq.) TRE1201B (406-420 MHz) or TRE1203B (450-470 MHz) or TRE1204B (470-494 MHz) or TRE1205B (494-512 MHz) KXN1024A Channel Element TRN8540A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6082A Digital PL Module TRN6005A Code Plug	Nothing	Model C04RTB6108.
C145A	TLN1460A Voting Module	TRN6085B Encoder Module	All C03RTB and C04RTB series models.
C180A	THN6243A 60-Inch Cabinet	THN6141A 30-Inch Cabinet	All C03RTB, C04RTB & C05RTB series models.
C192A	TMN6067A Handset	Nothing	All models.
C195A	THN6142A 41-Inch Cabinet	THN6141A 30-Inch Cabinet	All C03RTB, C04RTB & C05RTB series models.
C246A	TLE1802A 6-Port Multicoupler (with cables as required)	Nothing	All 450-470 MHz models.
C247A	TKN6844A Cable Kit for 4-Port Multi-coupler	Nothing	All C03RTB, C04RTB & C05RTB series models.
C248A	TKN6845A Cable Kit for 8-Port Multi-coupler	Nothing	All C03RTB, C04RTB & C05RTB seris models.
C111A	Add one 800 MHz Carrier Squelch Voting Receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6956A Audio Control Module TRN6085B Encoder Module TRF1011C Receiver KXN1029A Channel Element TRN8001A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids	Nothing	Model C05RTB1108.
C111A	Add one 800 MHz PL Voting Receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6956A Audio Control Module TRN6085B Encoder Module TRF1011C Receiver KXN1029A Channel Element TRN8001A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6083A Tone PL Module TLN8381A "Vibrasponder" Reed	Nothing	Model C05RTB3108

EPS-26627-O

"SPECTRA TAC" RECEIVER OPTIONS (Cont'd.)

OPTION	ADD	DELETE	APPLICABILITY
C111A	Add one 800 MHz DPL voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6956A Audio Control Module TRN6085B Encoder Module TRF1011C Receiver KXN1029A Channel Element TRN8001A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TRN6082A Digital PL Module TRN6005A Code Plug	Nothing	Model C05RTB6108.
C319A	Add one high band carrier squelch voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module RF-IF Deck (select freq.) TLD8271A (132-142 MHz) or TLD8272A (142-150.8 MHz) or TLD8273A (150.8-162 MHz) or TLD8274A (162-174 MHz) K1005A Channel Element TRN6334A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TLN5944A RQS Detector Module TLN5946A RQS Current Generator Module	Nothing	Model C03RTB1105.
C320A	Add one UHF carrier squelch voting receiver consisting of: TLN1991A Receiver Housing TRN6825A Receiver Shield Kit TPN1158A Power Supply TRN6080B Audio Control Module RF-IF Deck (select freq.) TRE1201B (406-420 MHz) or TRE1203B (450-470 MHz) or TRE1204B (470-494 MHz) or TRE1205B (494-512 MHz) KXN1024A Channel Element TRN8540A RF-IF Shield TRN6337A Cabinet Hardware Kit TRN6336A Receiver Service Aids TLN5944A RQS Detector Module TLN5946A RQS Current Generator Module	Nothing	Model C04RTB1105.
C330A	Change Status Tone from 2175 Hz to 2375 Hz.	Nothing	Model C03RTB1108 & C04RTB1108

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

1. INTRODUCTION

This manual describes Voting Receivers and Satellite Receivers used in Motorola "Spectra TAC" Total Area Coverage systems. Using an optional encoder, these receivers can also be used with older types of Motorola TAC systems using the Z00NNB series comparators.

The purpose of a TAC system is to provide extended talk-back range for a person using a low power transmitter such as a personal portable radio or a low power mobile radio. Several (two to 24) voting receivers are strategically placed in the area to be covered so clear reception of the low power transmitters is possible from at least one of the receivers anywhere in the area to be covered. All receivers are tuned to the same frequency so that, as the mobile or portable radio is moved from place to place, another receiver can pick up the signal.

The voting receivers are equipped with carrier squelch. Certain models also use "Private-Line" coded squelch; either tone-coded or digital-coded. Coded squelch disables the receiver until a correctly coded message is received. This prevents reception of calls from other users of a shared frequency.

Each voting receiver is equipped with a "Spectra TAC" encoder which provides a tone (Status Tone) when the receiver is squelched. This tone is used at the comparator location to enable voting, in-line checking, and in-path loss factoring.

Satellite receivers are the same as voting receivers except they do not use a TAC encoder and are not evaluated and compared in a comparator. In other words, they are monitor receivers.

In either case, receiver audio is coupled to the using site (comparator for TAC receivers or a console for satellite receivers) via a 600-ohm, 2-wire line or other path such as microwave link (MUX).

At the "Spectra TAC" comparator the signal quality of each receiver is compared and the receiver with the best signal is selected to be coupled (via an audio line or radio repeater) to the dispatcher or other user monitoring the frequency. The "Spectra TAC" comparator is described in Motorola Manual part number 68P81026E40.

At TAC sites using older comparators, receiver selection is made on the basis of the voting tones supplied by the voting receiver. The TAC Comparator is described in Motorola Manual part number 68P81063A40.

Voting receiver models are available for use in the 132-174 MHz, 406-420 MHz, and 450-512 MHz and 806-821 MHz bands. Satellite receiver models are available in the 25-50 MHz, 72-76 MHz, 132-174 MHz, 406-420 MHz, 450-512 MHz, and 806-821 MHz bands. All versions are covered in this manual.

2. DESCRIPTION

(See Figure 1)

2.1 GENERAL

The basic receiver is packaged in an rf-tight package suitable for mounting in a 19-inch rack, base station cabinet (compa or upright), or other suitable mounting frame. Voting receiver models are supplied mounted in a 30-, 41-, 60-, or 70-inch cabinet dependent on the number of receivers. Satellite Receiver models are not mounted in a cabinet.

2.2 RECEIVER

A "MICOR" receiver rf and i-f amplifier board is mounted to the left of the housing. The

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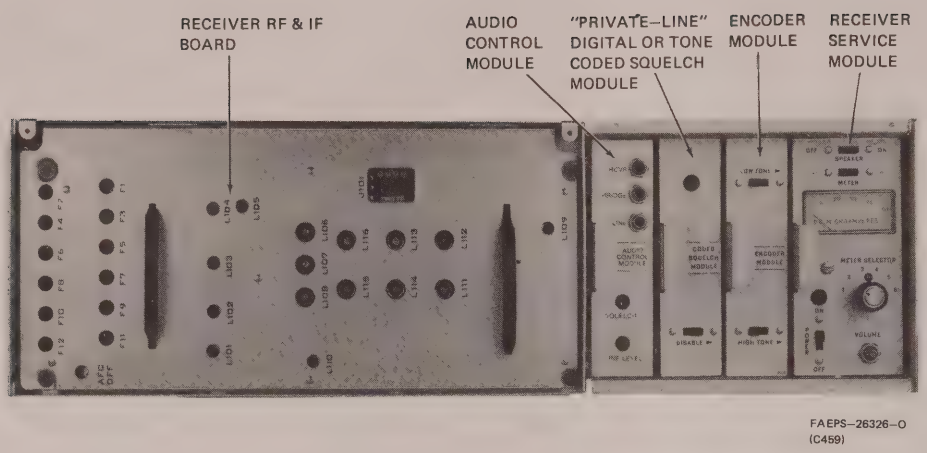

Figure 1. SpectraTAC Receiver

board plugs into a receiver interconnect board which connects the rf and i-f board to a module interconnect board on the rear of the cage (via a plug-in cable). A receiver shield kit is also provided. RF filters are provided for the receiver on the receiver interconnect board.

2.3 POWER SUPPLY

A 120 V/240 V 50/60 Hz power supply mounts in the cage, directly behind the receiver. It provides 13.8 V and 9.6 V for receiver rf and i-f board operation and also contains an emergency power alert and battery charger circuits for use when an emergency power option is used.

2.4 AUDIO CONTROL MODULE

An audio control module plugs into the card cage in the first position to the right of the receiver. The module contains a carrier squelch circuit, audio amplifiers, and a line driver. A built-in line equalizer is also provided in the module. Outputs are provided to drive a 600-ohm line, a handset, a speaker amplifier in the receiver service module and the coded squelch circuit (if used). Inputs to the module include receiver audio, a status tone from the encoder (voting receivers only), mic audio from a handset (for intercom use), and an emergency power alert (EPA) tone from the power supply (when ac power is lost and the receiver reverts to battery operation). Receiver audio is gated by the carrier squelch circuit, the coded squelch circuit (if used), and by an intercom P-T-T signal from the handset.

2.5 "PRIVATE-LINE" CODED SQUELCH MODULE

The "Private-Line" coded-squelch module (when used) plugs into the card cage to the right of the audio control module. The coded squelch module can be either a digital "Private-Line" coded model or a "Private-Line" tone-coded models. The module monitors the receiver audio and, when a correctly coded message is received, enables the receiver audio.

2.6 ENCODER MODULE

The TAC encoder (voting receivers only) plugs into the card cage to the right of the coded squelch module. In satellite receivers the position is vacant. In "Spectra TAC" systems the encoder provides a Status Tone whenever the receiver is squelched. Status Tone is turned off when the receiver is unsquelched. The module can also be used to generate high (2500 Hz) and low (400 Hz) test tones for use in equalizing audio response over the telephone line (or other path). An equalizer in the audio control module can be set (via jumpers) to add gain at either or both of the test frequencies.

In older TAC systems using Z00NNB comparators, an optional voting encoder is used in place of the "Spectra TAC" encoder. The

voting encoder measures the quieting level of the receiver and generates a tone code corresponding to the quieting level (in 10 dB steps) which is routed to the associated comparator. The tone code consists of four combinations of two tones: no tone (0 to 9 dB); tone A only (10 to 19 dB); tones A and B (20 to 29 dB) and tone B only (30 dB or greater). Tone A is 2250 Hz and Tone B is 2325 Hz.

2.7 RQS DETECTOR

The Receiver Quality Signal (RQS) Detector Module (IMTS) Systems only plugs into the card cage in the same position and in place of the Encoder Module. The RQS detector contains two noise sampling channels which are then summed in the output. One channel is tuned to amplify the 4200 Hz portion of the noise spectrum and the other is tuned to the 4800 Hz portion of the noise spectrum. The noise input then produces a dc output that is inversely proportional to the input. The RQS detector contains two variable controls to set the dc output for a given noise input.

2.8 RQS LINE CURRENT GENERATOR

The RQS Line Current Generator Module (IMTS Systems only) plugs into the card cage in the same position and in place of the Coded Squelch Module. The RQS line current generator provides a direct current over the receive phone lines. This current is proportional to the dc voltage received from the RQS detector. A level control sets the output current for a given input dc voltage.

2.9 RECEIVER SERVICE MODULE (OPTIONAL)

The optional receiver service module plugs into the card cage on the right hand side. It contains a speaker amplifier and speaker which monitors both receiver and line (intercom) audio. A test meter is also provided to check important receiver parameters and the line and speaker levels.

3. OPTIONS

The following accessories are available for use with the receivers.

3.1 RECEIVER SERVICE MODULE

Option C105AA adds the TLN1717A Receiver Service Module to any model of receiver. The receiver service module is described above.

3.2 EMERGENCY POWER OPTION

Option C28AB adds a TPN1141A Emergency Power Kit. The kit consists of a 12 V battery (8 ampere-hour) and cable kit with an in-line fuse. The standard power supply contains a battery charger for this kit. The battery will provide 24 hours emergency power and will automatically recharge in 48 hours after power is restored. The kit can be used with all models.

3.3 HANDSET OPTION

Option C192AA adds a TMN6067A Handset for use as an intercom over the line to the comparator site. The handset plugs into the module interconnect board and contains a push-to-talk switch. It can be used with all models.

3.4 CONVERSION KIT FOR OLDER TAC SYSTEMS

Option C145AD deletes the TRN6085B "Spectra TAC" Encoder and adds a TLN1460A Voting Encoder compatible with older TAC systems using the Z00NNB TAC Comparator. This option applies to high band and UHF voting receivers only (C04RTB and C03RTB Series Models). The encoders are described in paragraph 2.6.

3.5 132-174 MHz PREAMPLIFIER

Option C12AE adds a high band preamplifier (TLD8421B for 132-150.8 MHz or TLD8422B for 150.8-174 MHz) and a TKN6807A Cable Kit. The 10 dB gain preamplifier increases receiver 20 dB quieting sensitivity from 0.5 uV to 0.25 uV. This option applies to high band voting and satellite receivers (C03RTB and N03RTB Series Models).

3.6 UHF PREAMPLIFIER

Option C12AD adds a UHF preamplifier (TLE8191A for 406-450 MHz or TLE8192A for 450-512 MHz) and a TKN6812A Cable Kit. The 10 dB gain preamplifier increases receiver 20 dB quieting sensitivity from 0.5 uV to 0.25 uV. This option applies to UHF voting and satellite receivers (C04RTB and N04RTB Series Models).

3.7 ADDITIONAL RECEIVER

Several options are available to add receivers, they are:

OPTION	ADDS
C102AK	High Band Carrier Squelch Receiver

OPTION	ADDS
C102AL	High Band PL Tone-Coded Squelch Receiver
C102AM	High Band PL Digital Coded Squelch Receiver
C117AL	UHF Carrier Squelch Receiver
C117AM	UHF PL Tone-Coded Squelch Receiver
C117AN	UHF PL Digital-Coded Squelch Receiver
C111AD	800 MHz Carrier Squelch Voting Receiver
C111AE	800 MHz PL Voting Receiver
C111AF	800 MHz DPL Voting Receiver

No cabinet or service module is provided with the additional receivers, however, they are mounted in the cabinet with the model.

3.8 ANTENNA COUPLERS

A 6-port antenna coupler is available as a standard option to permit up to six UHF receivers from a common antenna. Option C246AA adds a Model TLE1802A 6-Port Multicoupler and the required rf cables for interconnection. Two optional cable kits are available for use with 4 and 8-port multicouplers which must be purchased separately (not supplied as a standard option). Option C247AA provides a TKN6844A Cable Kit for a 4-port coupler. Option C248AA provides a TKN6845A Cable Kit for an 8-port coupler.

3.9 CABINETS

Four cabinet options are available for voting receivers (C03RTB, C04RTB and C05RTB models). Each option deletes the standard THN6141A 30-inch "Compa" Cabinet. Option C27AF adds a THN6303A 46-inch outdoor cabinet. Option C36AJ adds a THN6058A 70-inch outdoor cabinet. Option C180AD adds a THN6243A 60-inch indoor cabinet. Option C195AC adds a THN6142A 41-inch indoor cabinet.

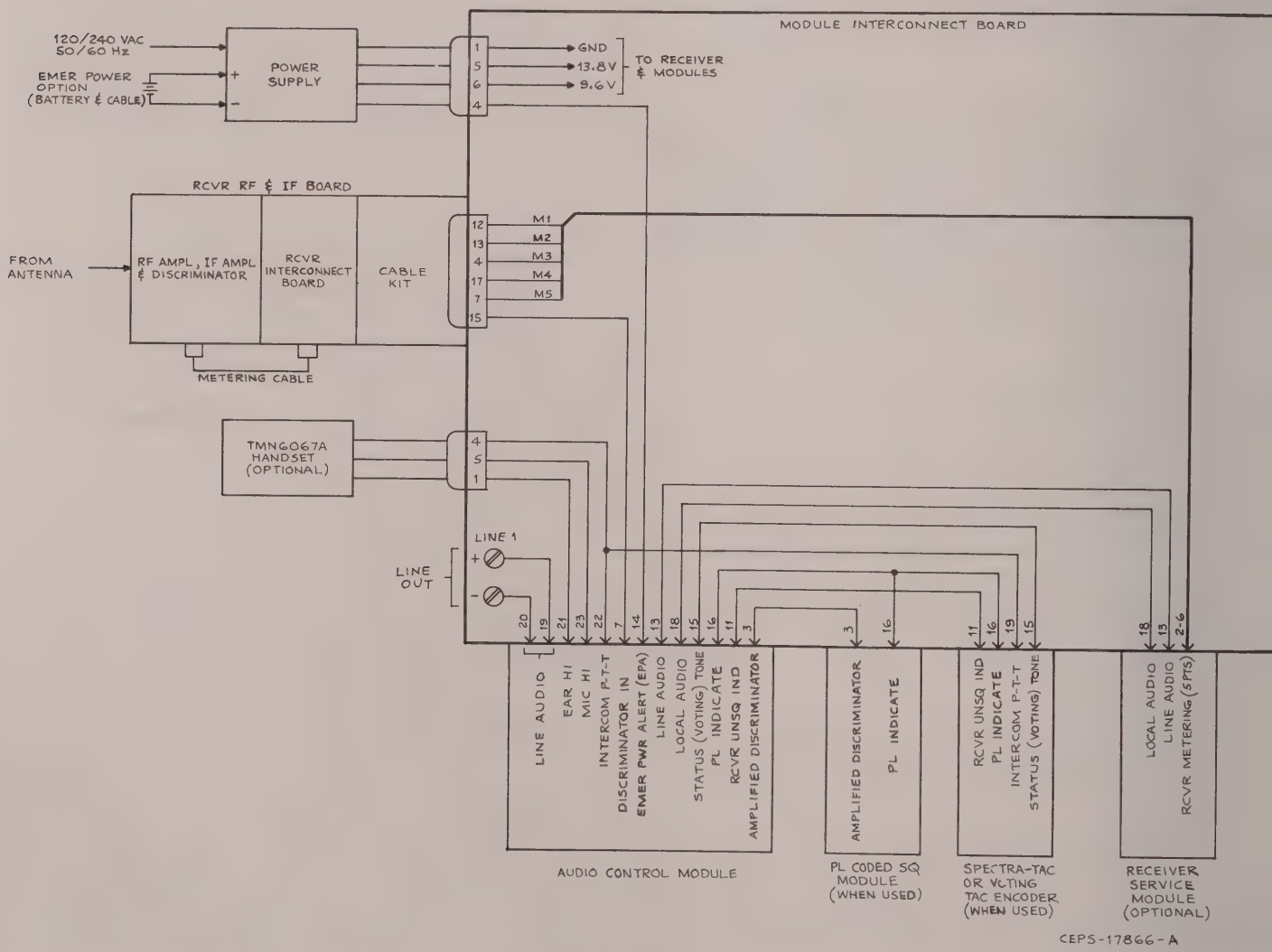

Figure 2.
Receiver, Block Diagram

INSTALLATION

1. INSPECTION

Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

2. PLANNING THE INSTALLATION

Since a good installation is so important to obtain the best possible performance of the communications system, carefully plan the installation before actual work is started. Location of the station in relation to power, audio lines, the antenna, convenience and access for servicing should be considered. The cabinet dimensional detail diagrams show the size of the various cabinets for planning the space requirements. Read the entire procedure and the many suggestions offered to help you plan your installation. Make sure all tools, equipment and facilities are available when the installation is begun.

3. VENTILATION

This equipment is operated without forced ventilation. The cabinets have vents which allow outside air to be drawn in through an opening in the bottom of the doors and expelled through an opening in the top of the doors. The heated air rising in the cabinet causes a natural draft. Therefore, it is essential that the openings be kept free of obstructions so the air flow will not be restricted. The vents on outdoor type cabinets provide necessary station ventilation and in addition prevent rain, snow, etc. from entering the cabinet.

4. INSTALLATION OF RECEIVER

4.1 WITH CABINET

The cabinet should be located on a solid, level surface convenient to the power source and the transmission line. The transmission line to the antenna should be kept as short as possible to minimize line losses.

Outdoor cabinets are not intended to withstand submersion in water. If pools of water could gather around the base, it is recommended that the cabinet be elevated on a suitable support or platform.

Although outdoor cabinets are built to be installed outdoors, it should be realized that maintenance of the equipment is not easily accomplished in inclement weather. It is therefore recommended that the equipment be installed inside of an enclosure which would give protection to the serviceman and the test equipment he may be using. A suggested enclosure would be an elevator penthouse or a small building no less than six feet square and eight feet tall as measured on the inside.

If the cabinet is to be installed outdoors, the rain shield should be installed as follows:

Step 1. Install the main section (largest fabricated assembly) over the opening in the top of the cabinet using the rectangular shaped gasket and 1/2-inch sheet metal screws provided.

Step 2. Mount the smaller of the two rectangular covers inside the main section using the machine screws provided.

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Step 3. Apply ac input power to the receiver.

Step 4. Using a TEK-37 Adapter Cable, connect a Motorola portable test set or meter panel to the station as follows:

--Connect the adapter cable 20-in connector to the receptacle on the front of the test set or meter panel.

--Connect the adapter cable 7-pin white "metering" plug to the metering receptacle on the receiver rf and i-f board.

Step 5. Set the portable test set switches as follows:

--Set the function switch to the RCVR position.

--Set the meter reversing switch to the OFF position.

--Set the adapter cable SENS switch to the 100 mV position. If the adapter cable has no SENS switch, the unit operates at 100 mV all of the time.

--Set the adapter cable reference switch to position A or position B.

Step 6. Refer to the meter reading table in paragraph 1.2.1. Set the test set selector switch to the positions called for in the table and observe the test set meter. Notice that the meter readings given in the table are minimums.

1.2.1.4 Using Built-In Receiver Metering

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the station.

Step 4. Plug the receiver service kit into the station.

NOTE

The receiver service kit will not operate unless the TKN6759A Cable Kit has been installed in the receiver.

It is not necessary to turn the metering POWER switch on. The switch should only be in the "on" position when the METER SELECTOR switch is set on position 6.

Step 5. Refer to the meter reading table in paragraph 1.2.1. Set the meter selector switch to the positions called for in the table and observe the meter. Notice that the meter readings given in the table are minimums.

1.2.2 20 dB Quieting Sensitivity Test

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service. The receiver shield must be in place while performing this test.

1.2.2.1 Using An AC Voltmeter And Portable Test Set

Step 1. Perform steps 1 thru 5 in paragraph 1.2.1.3.

Step 2. Connect an ac voltmeter across pins 1 and 18 of the audio control module.

Step 3. (PL receivers only) Disable PL, using the switch on the PL module.

Step 4. Set the receiver squelch control fully counterclockwise (unsquelched).

Step 5. Adjust the LINE LEVEL control so the ac voltmeter reads 565 mV ac.

Step 6. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until test set meter position 4 reads exactly zero.

Step 7. Slowly decrease the signal generator output level until the ac voltmeter reads 56.5 mV ac (20 dB down from 565 mV ac). Switch to a lower voltmeter scale if necessary.

the power supply board at the screw terminals labeled BATT (+) and BATT (-) Feed the cable through the hole provided for the ac power cord while replacing the back cover. Do not connect the other side of a fabricated battery cable directly to a battery. Insure first that the cable has an in-line 2 amp slow-blow fuse, then observing polarity, connect the cable (with in-line fuse) to the battery.

5.1.4 Connection to Existing 12 V Supply

This information deals with the connection of power to receivers that are not equipped with a 12 V power supply and receive their power from another unit.

Connect the 12 V dc positive line to the screw terminal on the module interconnect board marked A+. Connect the negative, or ground line, to the screw terminal marked GND. If the receiver is not equipped with a 9.6 V regulator, the external supply must also supply 9.6 V in addition to A+. Connect the 9.6 V line from the supply to the screw terminal on the module interconnect board labeled 9.6 V.

5.2 ANTENNA CONNECTIONS

5.2.1 Without Multicoupler

Connect the antenna cable to the antenna type "N" connector located on the rear of the receiver. If the receiver is mounted in a cabinet, use a right angle type "N" connector (Motorola Part No. 28A817985) to make the connection at the rear of the receiver. This prevents undue stress on the cable when the door is closed.

5.2.2 With Multicoupler

When a multicoupler is used in multi-receiver systems, the multicoupler is installed in the cabinet at the factory. The only connection required is to connect the antenna to the input port of the multicoupler.

5.3 AUDIO LINE CONNECTIONS

Connect the audio line (this may be a telephone line or any other 600 ohm line) to the screw terminals on the module interconnect board marked Line 1 (+) and (-).

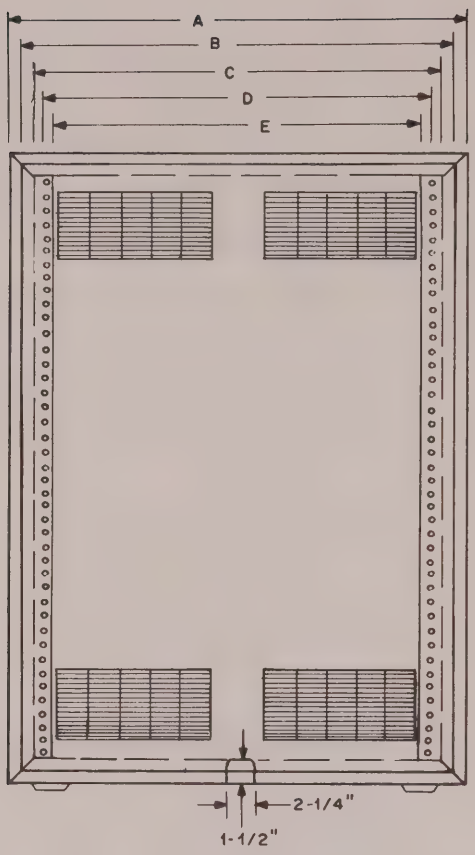
5.4 FIELD INSTALLATION OF RECEIVER SERVICE MODULE CABLE

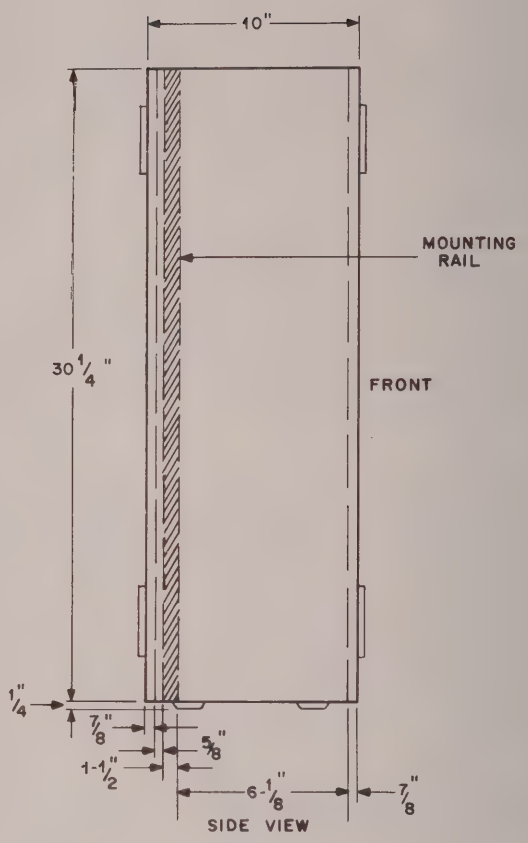
The following procedure is only required when the receiver service module is to be used in a receiver in which the metering option has not been installed at the factory.

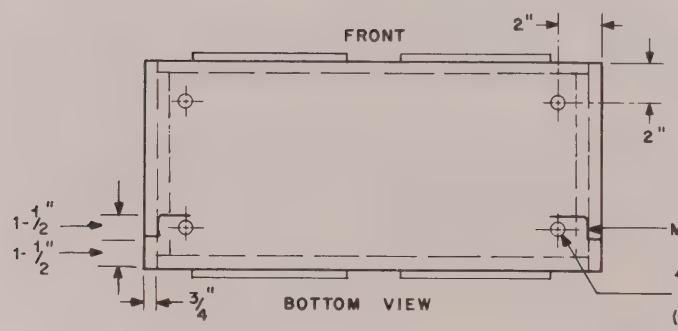
Remove the RF-IF board. Plug one side of a TKN6759A Cable Kit into the board metering receptacle J101. Plug the other end into J102, the meter test receptacle, on the receiver interconnect board. Replace the RF-IF board. The station is now capable of built-in metering whenever a receiver service module is plugged into the card cage.

6. PREOPERATIONAL ADJUSTMENTS

Prior to receiver operation the squelch, status tone, and line audio levels should be set. For the details of these preoperational adjustments, refer to Maintenance section of this manual.







A = 22" CABINET WIDTH
B = 20-1/2" DOOR OPENING
C = 19-3/16" CABINET OPENING
D = 18-5/16" MTG. HOLE CENTERS
E = 17-11/16 CLEARANCE BETWEEN RAILS

CEPS-8570-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6337A Cabinet Hardware Kit PL-3506-O

	2-836540	SPEED NUT (4 req'd.)
	3-135499	SCREW, tapping ; 1/4 - 14 x 5/8" (4 req'd.)

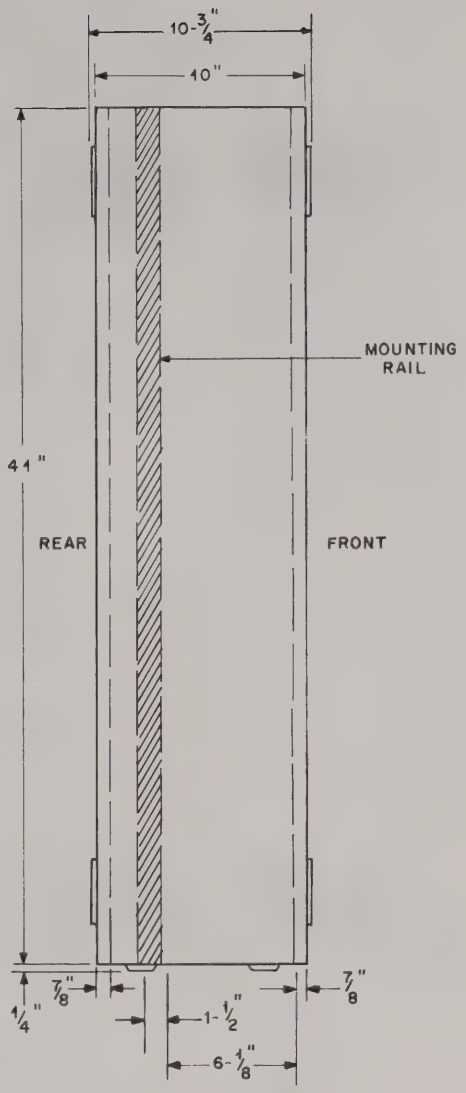
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

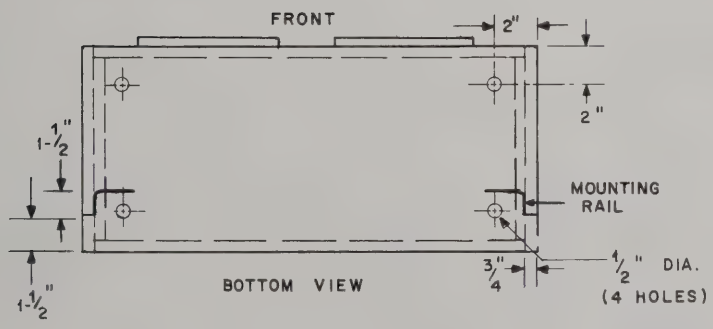
THN6141A Cabinet Kit (30 inch) PL-1787-E

NON-REFERENCED ITEMS		
	15E84107D25	CABINET (30")
	13C84430D01	DOOR VENT (8 required)
	2S10101A55	SPEED NUT (48 required)
	1-80730D78	COVER, cabinet entry

REAR VIEW



SIDE VIEW



BOTTOM VIEW

A = 22" CABINET WIDTH
B = 20-1/2" DOOR OPENING
C = 19-3/16" CABINET OPENING
D = 18-5/16" MTG. HOLE CENTERS
E = 17-11/16" CLEARANCE BETWEEN RAILS

CEPS-8571-B

PARTS LIST

TRN6337A Cabinet Hardware Kit PL-3506-O

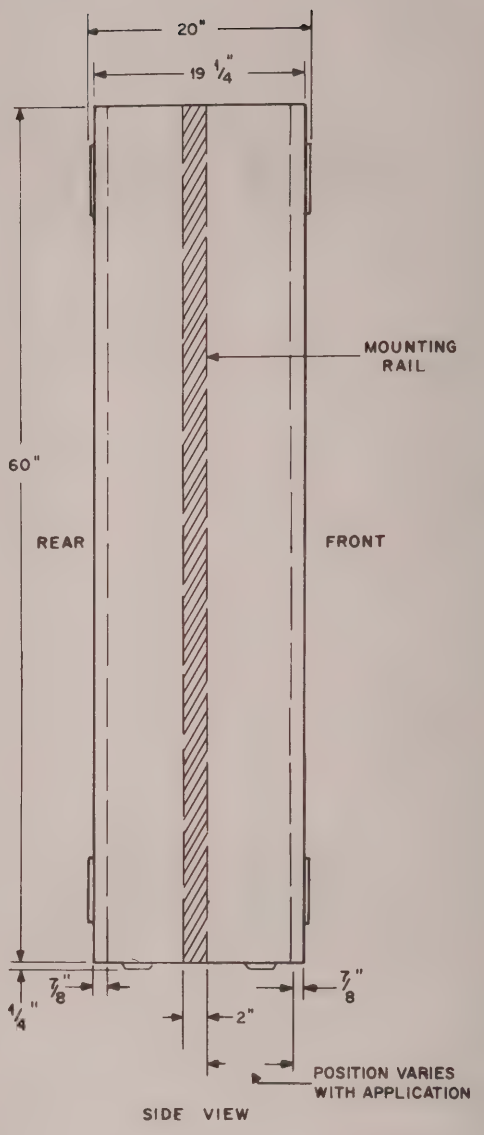
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-836540	SPEED NUT (4 req'd.)
	3-135499	SCREW, tapping ; 1/4 - 14 x 5/8" (4 req'd.)

THN6142A Cabinet Kit (41-Inch) PL-1790-C

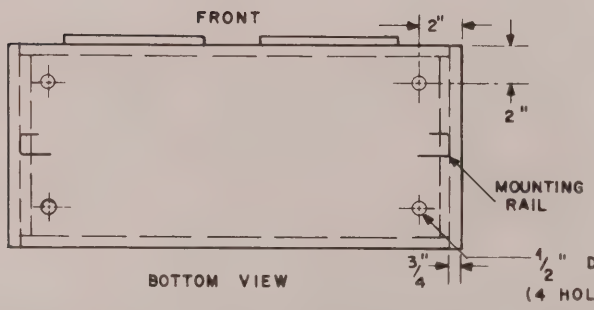
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS		
	15E84143D24	CABINET (41")
	13C84430D01	DOOR VENT (8 required)
	2S10101A55	SPEED NUT (48 required)
	1-80730D78	COVER, cabinet entry

41" Cabinet Dimensional Detail & Parts List
Motorola No. PEPS-17877-B
7/15/81-UP

REAR VIEW



SIDE VIEW



BOTTOM VIEW

A = 22" CABINET WIDTH
B = 20-1/2" DOOR OPENING
C = 19-3/16" CABINET OPENING
D = 18-5/16" MTG. HOLE CENTERS
E = 17-11/16" CLEARANCE BETWEEN RAILS

CEPS-17187-B

PARTS LIST

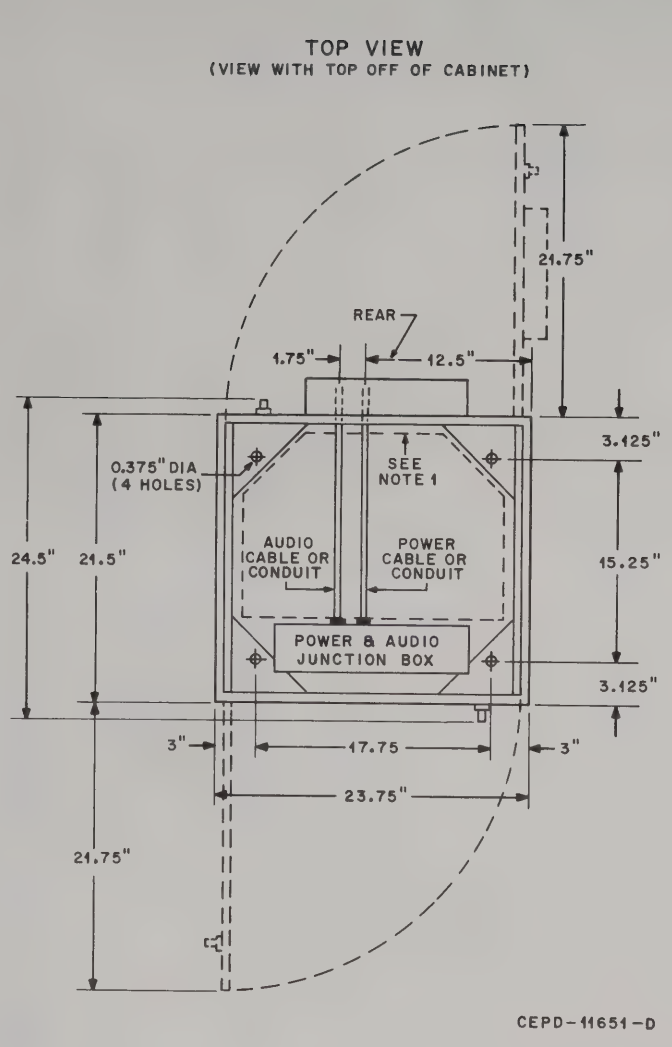
TRN6337A Cabinet Hardware Kit — PL-3506-O

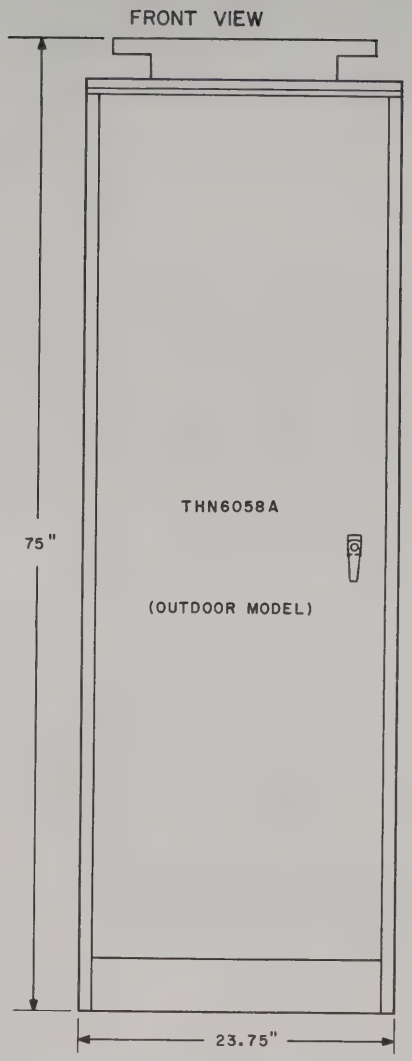
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	2-836540	SPEED NUT (4 req'd.)
	3-135499	SCREW, tapping ; 1/4 - 14 x 5/8" (4 req'd.)

THN6243A Cabinet Kit (60-inch) — PL-3401-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	15-83445K04	CABINET (60-inch)
	13-84430D01	DOOR VENT (8 required)
	2-10101A55	SPEED NUT (48 required)
	1-80730D78	COVER, cabinet entry

60" Cabinet Dimensional Detail & Parts List
Motorola No. PEPS-17894-B
7/15/81- UP





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6337A Cabinet Hardware Kit PL-3506-O

	2-836540	SPEED NUT (4 req'd.)
	3-135499	SCREW, tapping : 1/4 - 14 x 5/8" (4 req'd.

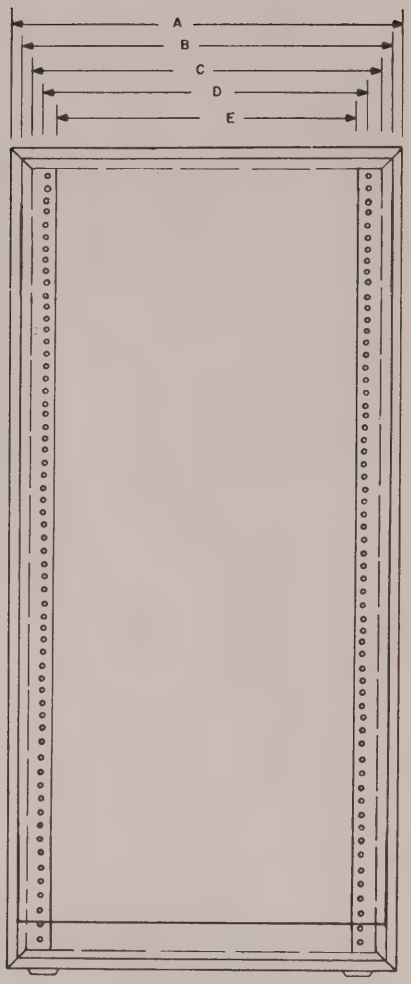
THN6058A Cabinet Kit (70 inch) PL-5625-O

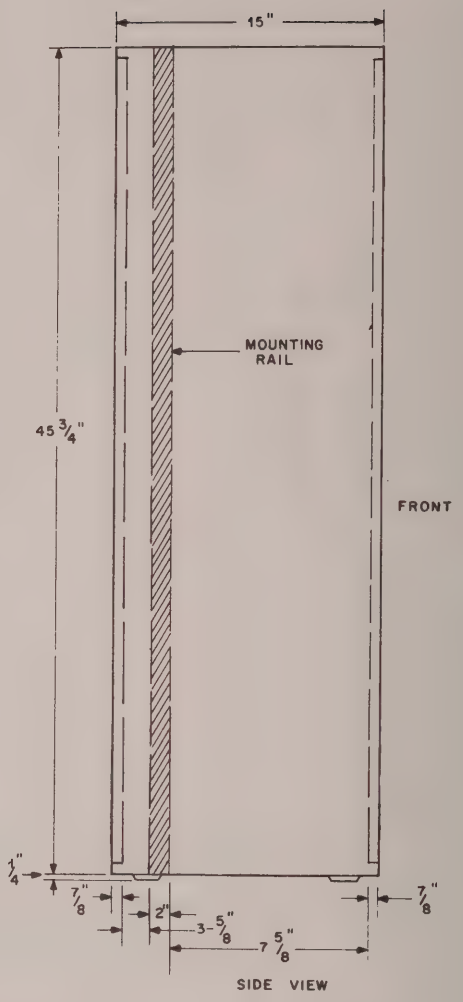
	15-82123H03	CABINET, outdoor (70-inch)

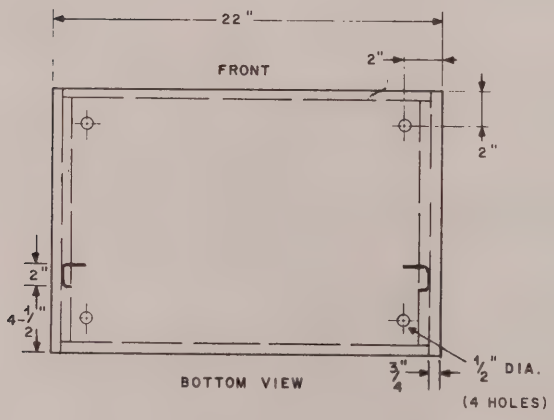
TLN6892A Rain Shield Kit PL-5770-O

15-82926H01	15-82926H01	COVER, rain shield
	26-82930H01	SHIELD, rain (door)
	26-82929H01	SHIELD, rain (top)
	26-84084F01	SHIELD, cover (top)
	32-82932H01	GASKET, rain shield
	32-82932H02	GASKET, rain shield
	32-84180G01	GASKET
	32-84180G02	GASKET
	2-10080A03	NUT, spring: 8-32 x 11/32"; 4 used
	3-132823	SCREW, machine: 8-18-3/8"; 8 used
	3-135014	SCREW, tapping: 8-18-1/2"; 6 used

NOTES:
1. IF ENTRANCE OF POWER AND AUDIO CABLES THROUGH BOTTOM OF CABINET IS DESIRED, AREAS ENCLOSED BY DOTTED LINES MAY BE USED.
2. FRONT AND REAR DOORS CAN BE REVERSED FROM RIGHT OPENING TO LEFT HAND OPENING.
3. ELEVATE CABINET IF DANGER OF WATER SUBMERSION EXISTS.







A = 22" CABINET WIDTH
B = 20-1/2" DOOR OPENING
C = 19-3/16" CABINET OPENING
D = 18-5/16" MTG. HOLE CENTERS
E = 17-11/16" CLEARANCE BETWEEN RAILS

CEPS-25455-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6448A Cabinet Hardware Kit — PL-3626-O

	2-836540 3-135499	SPEED NUT (4 req'd.) SCREW, tapping; 1/4 - 14 x 5/8" (4 req'd.)

THN6303A Cabinet (46-Inch) — PL5771-O

	15-84144D11	CABINET, outdoor

46" Outdoor Cabinet
Dimensional Detail and Parts List
Motorola No. PEPS-25456-A
6/15/78- UP

1. INTRODUCTION

This section contains maintenance instructions for the complete receiver package (satellite or voting). Additional maintenance data (such as dc voltage readings, ac signal levels, waveforms, etc.) for the rf & i-f board, power supply, and plug-in modules, are included in the appropriate sections of the manual.

2. RECOMMENDED TEST EQUIPMENT

Recommended test equipment is shown in Table 1.

3. LOCAL OPERATING PROCEDURE

3.1 INTERCOM OPERATION

The intercom permits two-way communication between the receiver and the comparator or console. Operation requires plugging the TMN6067A Handset into J3 of the receiver chassis. Depress the switch on the handset for both transmission and monitoring. Line audio can also be monitored at the speaker of the optional receiver service module if the SPEAKER switch is in the on position. Refer to Figure 1 for adjustment control location.

3.2 RECEIVER SERVICE MODULE

Plug the service module into the appropriate slot in the card cage. Turn the power switch on the receiver service module off when the service module is not in use. See the Service Module section and the Receiver RF & I-F sections in this manual for additional information.

4. PREVENTIVE MAINTENANCE

4.1 VISUAL INSPECTION

4.1.1 Check all of the external surfaces of the equipment to see that they are clean. Inspect all connecting cables and audio lines for damage and loose connections.

4.1.2 If the equipment is dirty, wash the external surfaces with soap and water using a clean cloth. Commercial spray or cleansers can also be used. Be careful! Never allow the electronic components or connectors to get wet.

4.2 PERIODIC CHECKS

It is recommended that the following steps be performed quarterly.

Step 1. Measure and record meter readings using the receiver service module or a portable test set. Record the readings in the meter reading log and compare them to previous readings, noting any changes that have occurred since the last reading.

NOTE

If the optional receiver service module is used, a portable test set cannot be plugged into J101 on the RF & I-F board.

Step 2. Check the quieting sensitivity of the receiver. The procedure can be found in the Receiver RF & I-F section of this manual.

Step 3. Inject into the receiver an rf signal modulated by 1 kHz with ±5 kHz deviation and

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Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

TABLE OF RECOMMENDED TEST EQUIPMENT

TYPE OF EQUIPMENT OR TYPE OF MEASUREMENT	EQUIPMENT CHARACTERISTICS	RECOMMENDED TYPE
Receiver metering	No equivalent. Use recommended type.	Motorola Model S1056 to S1059 Portable Test Set (if optional receiver service module is not used.)
RF Signal Generator for receiver testing	25 to 960 MHz; FM; high-stability- (±.0002% or better); adjustable output 0 to 1000 microvolts	Motorola Model R1200 Series Service Monitor Motorola R1201 Series Signal Generator
Audio Voltage Measurements	High impedance (10 megohm); dBm scale	Motorola Model S1053 Solid-State AC Voltmeter
Audio Signal Generator for audio circuit testing in receiver and transmitter	Variable amplitude 0 to 1 volt; 1000-Hz tone (300- to 3000-Hz preferred); sinusoidal wave	Motorola Model S1067 Solid-State Audio Oscillator Motorola Model TEK-1 Tone Oscillator Motorola Model R1200 Series Service Monitor
DC Voltage Measurements, Resistance Measurements, RF Voltage Measurements	High impedance (11 megohm) dc multimeter	Motorola S1063 Solid-State DC Multimeter with SLN6055A RF Probe Motorola Model R1001 Digital Multimeter
Waveform Measurements	Oscilloscope: Audio circuit measurements	Oscilloscope
"Private-Line" tone injection for PL decoder circuit measurements	"Private-Line" tone generator using "Vibrasender" resonant reed for frequency accuracy; or audio oscillator with frequency counter for accurate setting of oscillator.	Motorola Model S1333 Audio Synthesizer Motorola Model SLN6221A "Private-Line" Tone Generator
"Private-Line" digital code injection for digital PL decoder circuit measurements.	"Private-Line" Digital code generator using code plug for proper code. Also tests code plugs.	Motorola Model SLN6413A Digital "Private-Line" Test Set.

check the line level of the tone across the LINE 1 (+) and (-) terminals on the module interconnect board. The correct value depends on the type of line and the system requirements. The status tone will only be present when the receiver is squelched. (Tone Voting Receivers only.) The status tone level should be equal to 5 kHz (full system deviation) in 0 dB systems and 13 dB down from full system deviation in -13 dB systems.

Step 4. Check the line equalization in accordance with paragraph 6.3.

5. ACCESSIBILITY

To gain access to the power supply and the back of the receiver interconnect board, remove the rear shield. To expose the rf & i-f board remove the receiver shield and the rf & i-f shield.

6. SYSTEM ADJUSTMENTS

6.1 LINE LEVEL ADJUSTMENT

6.1.1 Introduction

There are two basic reasons for observing correct line level settings; (1) not to exceed maximum levels allowed by the phone company, and (2) assure correct operation of the "Spectra-TAC" equipment. The phone company will specify a maximum audio level on the phone line and the customer must specify the signal level required at the opposite end which determines the maximum line loss. In addition, for voice quality lines, the phone company may specify the maximum allowable power level. This is done to minimize crosstalk and equipment overloading. The maximum power level is determined by averaging the audio signal level over a 3-second period. Due to the pauses between speech syllables and words, the 3-second average will be in most cases, a power level 13 dB below the peak level of voice. The allowable peak level of voice is specified by the phone company as the Transmission Level Point (TLP). A 1000 Hz tone at full system deviation (±5 kHz) is recommended for setting the line level.

6.1.2 Procedure

Step 1. Be sure JU11 on the TRN5956A, TRN6080A or B Audio Control Module is in for a 0 dB system and out for a -13 dB system in tone voting receivers. In satellite receivers, JU11 is in. Refer to Figure 2 for jumper locations.

Step 2. The line level is adjustable down to -20 dBm, however, if the level setting is to be set below -10 dBm, it is recommended that JU8 in the TRN6080B Audio Control Module or JU10 in the TRN6080A Audio Control Module be installed before the level is set. It is especially important that this jumper be installed when the line is used for microwave multiplex applications.

Step 3. Connect an ac voltmeter to the LINE 1 (+) and (-) screw terminals on the module interconnect board. If LINE 1 terminals are not connected to the comparator, the meter must be bridged by a properly terminated phone line.

Step 4. Turn the SQUELCH control fully counterclockwise and disable the coded squelch module (if used).

Step 5. Inject a 1000 uV carrier frequency signal at the antenna input of the receiver.

Step 6. Modulate the receiver input with a 1000 Hz test tone at ±5 kHz deviation. Determine

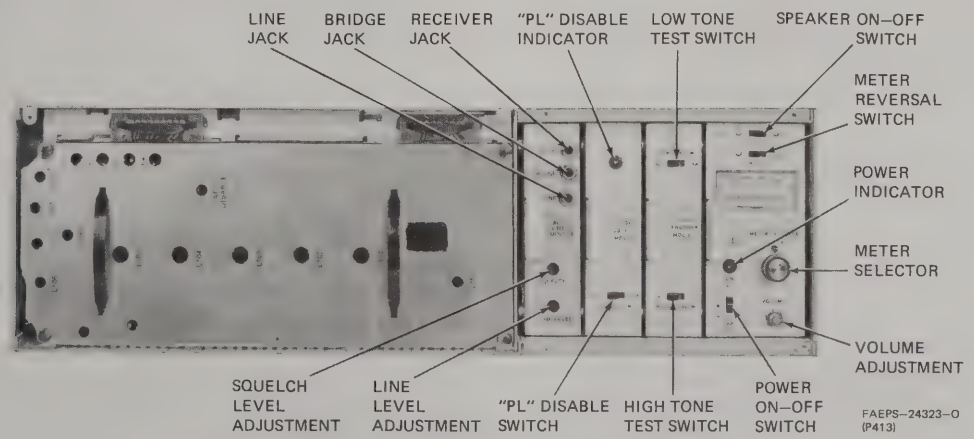

Figure 1. Location of Adjustment Controls

the maximum allowable level permitted on the line and set the LINE LEVEL control on the audio control module for this level. If the specified maximum is the maximum allowable power (3 second average), then set the LINE LEVEL control for 13 dB above this level. Do not exceed +11 dBm.

6.2 STATUS TONE LEVEL ADJUSTMENT (Tone voting receivers only)

6.2.1 General

6.2.1.1 Status tone level settings must be done correctly to assure correct receiver voting at the comparator. The AGC circuitry on the Signal Quality Module provides compensation for phone line losses and permits correct receiver voting. The AGC circuitry is "set" relative to the status tone generated by the receiver Encoder Module. The Encoder Module must be installed in a TLN8799A Extender Card for TONE LEVEL adjustment access.

6.2.1.2 Two methods of Status Tone Level Adjustment procedures are employed in the "Spectra TAC" receivers depending upon the type of Signal Quality modules utilized in the "Spectra TAC" comparator. It is recommended that the status tone level be adjusted only after the line level has been adjusted, because both the LINE LEVEL and TONE LEVEL controls affect the level of the status tone on the line.

6.2.2 0 dB System

In a 0 dB system, the TRN6091A Signal Quality Module is required, or a TRN6091B Signal Quality Module may be jumpered to operate as a TRN6091A by installing JU4. The status tone level must be adjusted equal to receiver peak audio at full system deviation (±5 kHz). The status tone must not exceed maximum power and peak audio levels specified by the phone company. Proper 0 dB system operation requires that both JU3 and JU5 be IN on Model TRN6085B "Spectra-TAC" Encoder module.

6.2.2.1 Procedure

Step 1. Connect an ac voltmeter across the LINE 1 (+) and (-) terminals which must be terminated by a 600-ohm load. Disconnect any rf input to the receiver. Turn the SQUELCH control fully clockwise until the receiver is fully squelched.

Step 2. Adjust the TONE LEVEL control on the Encoder Module until the line level, as measured by the ac voltmeter, is the same as the 1000 Hz test tone level set in Step 6 of paragraph 6.1.2.

Step 3. Remove the Extender Card and re-install the Encoder Module in the card cage.

6.2.3 -13 dB System

In a -13 dB system, the TRN6091B Signal Quality Module is utilized, JU4 is removed, and JU11 in the receiver Audio Control Module must be removed. The status tone level must be adjusted 13 dB below receiver peak audio at full system deviation (±5 kHz). Proper -13 dB system operation requires that both JU3 and JU5 be OUT on Model TRN6085B "Spectra-TAC" Encoder module.

6.2.3.1 Procedure

Step 1. Connect an ac voltmeter across the LINE 1 (+) and (-) terminals which must be terminated by a 600-ohm load. Disconnect any rf input to the receiver so that the receiver is squelched.

Step 2. Adjust the TONE LEVEL control on the TRN6085B Encoder Module until the line level, as measured by the ac voltmeter, is 13 dB below the 1000 Hz test tone level set by the LINE LEVEL control.

Step 3. Remove the Extender Card and re-install the Encoder Module in the card cage.

6.3 LINE EQUALIZATION ADJUSTMENT

6.3.1 General

The purpose of the line equalization procedure is to ensure sufficient audio gain to the comparator site to compensate for line losses. Two men are required to perform the line equalization procedure; one man at the receiver site and one man at the comparator site. The man at the receiver site measures the line level at the output of the receiver while the man at the comparator site measures the line level at the input to the comparator. Line Equalization is performed by setting the 1 kHz test tone (used in the line level adjustment procedure) equal to the LOW and HIGH test tone levels generated by the encoder module.

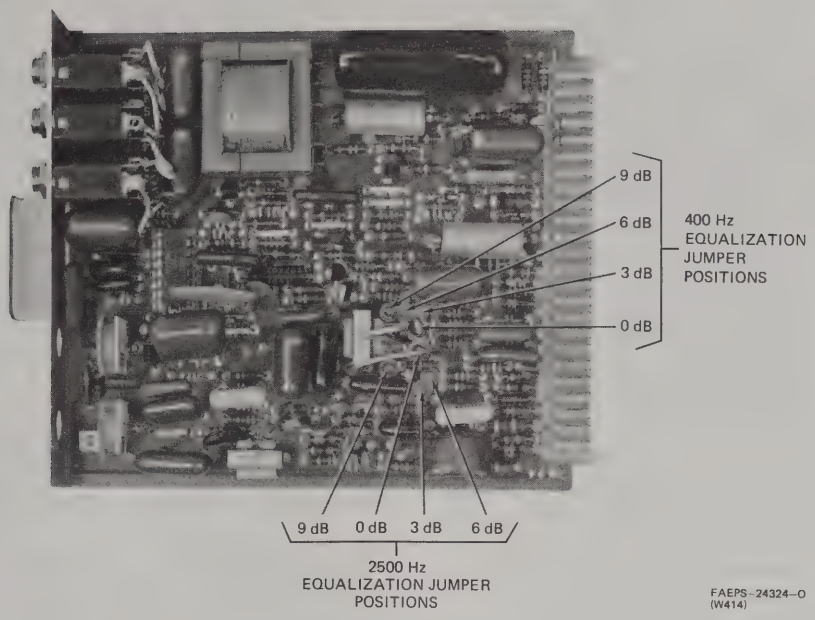

Figure 2. Audio Control Module Line Equalization Jumper Locations

NOTE

The LOW and HIGH TONE switches are not available on the TLN1460A Voting Module. The 400 Hz, 1000 Hz, and 2500 Hz test tones must be generated using an audio oscillator at the LINE (+) and (-) terminals on the receiver interconnect board.

The Audio Control Module must be installed in an Extender Card for equalization adjustment access.

6.3.2 Procedure

Step 1. Establish communications between both sites. The TMN6067A Handset may be used for transmission and monitoring purposes at the receiver and comparator sites. Plug the handset into J3 on the receiver module interconnect board. Refer to the Maintenance section of the comparator manual (68P81026E40) for further instructions regarding operation of the handset at the comparator site.

Step 2. At the receiver site, be sure the 400 Hz, 2500 Hz, and 1 kHz test tones are at equal levels.

Step 3. Send the 1 kHz test tone, making sure the man at the comparator site measures and records the received level.

NOTE

Maximum equipment input level is +11 dBm. Be sure not to exceed this limit at any time.

Step 4. At the receiver site, send the 2500 Hz high tone by setting and holding the momentary HIGH TONE switch on the encoder module. At the comparator site, measure and compare this level with the 1 kHz level previously recorded. Inform the man at the receiver site of the difference.

Step 5. At the receiver site, install the 2500 Hz equalization jumper on the Audio Control Module (refer to Figure 2) in the position necessary to obtain the level equivalent to the 1 kHz level.

Step 6. Repeat Steps 4 and 5 using the 400 Hz low tone switch and equalization jumper.

Step 7. Repeat the entire procedure to ensure correct equalization adjustment.

Step 8. Remove the Extender Card and re-install the Audio Control Module in the card cage.

6.4 SQUELCH LEVEL ADJUSTMENT

The level at which the carrier squelch control on the audio control module is set depends

on system requirements and the users needs. In systems using the "Spectra-TAC" series comparators, the squelch level is set for 20 dB quieting. In systems using the older Z00NNB series comparators, an optional TLN1460A Voting Module is used and the squelch must be set below the lowest level at which voting occurs. In these systems, the voting module gnerates voting tones when the rf input level corresponds to 10, 20, and 30 dB quieting of the local audio. Therefore, it is recommended that the squelch be adjusted at an rf input which corresponds to 8 dB quieting (2 dB below the lowest voting level) to insure that the receiver is unsquelched when voting occurs. Refer to the receiver RF & IF section of this manual for the procedure to determine the quieting level. Disable the PL circuitry (in "Private-Line" systems only) and inject a signal corresponding to the quieting level into the receiver and turn the SQUELCH control clockwise to the point at which the receiver just squelches.

NOTE

For Improved Mobile Telephone Service (IMTS) applications only, squelch should be set for IMTS system standard. If there is no standard, set squelch for 12 dB of quieting.

6.5 TLN1460A VOTING MODULE LEVEL ADJUSTMENT (In systems using older Z00NNB Comparators only)

There are three quieting level controls on the TLN1460A Voting Module which determine the voting tones sent to the comparator. These controls must be set for the desired quieting levels (normally 10, 20, and 30 dB) at which the voting tones are generated. In addition, there are two tone level controls which set the output level of the voting tones.

6.5.1 Quieting Level Adjustment Procedure

Step 1. Remove the voting module from the card cage and insert the TLN8799A Extender Board in its place. Insert the voting module into the extender board.

Step 2. In PL systems only, set the DISABLE switch on the PL decoder module to the right (disable position).

Step 3. Place the NORMAL-TEST switch on the voting module to the NORMAL position, and the OFF-A-B switch to either the A or B position.

Step 4. Inject an on-frequency signal into the receiver with a generator set for 10 dB quieting. Place the LEVEL 3 control (R11) to its maximum counterclockwise position. Adjust the LEVEL 1 control (R13) until the A light is just continuously on.

NOTE

Quieting is measured at local audio pin 18 of the audio control module. Do not attempt to measure quieting on the line output terminals.

Step 5. Inject an on-frequency signal into the receiver with a generator set for 20 dB quieting. Adjust the LEVEL 2 control (R14) until the B light is just continuously on. The A light will also be on.

Step 6. Inject an on-frequency signal into the receiver with a generator set for 30 dB quieting. Adjust the LEVEL 3 control (R11) until the A light is just continuously off. The B light will remain on.

Step 7. Remove the extender board and place the voting module back into the card cage.

Step 8. OPTIONAL SET LEVELS. The 10 dB, 20 dB and 30 dB levels are recommended quieting levels, but other levels may be accommodated. To set up the voting module for other levels start with the lowest desired quieting level for LEVEL 1 by injecting an on-frequency signal set at the desired LEVEL 1 quieting and adjust R13 until the "A" light is just continuously on. Do the same for LEVEL 2 and 3, adjusting R14 and R11 in turn.

6.5.2 Voting Tone Level Adjustment Procedure

Step 1. Perform the line level adjustment procedure (paragraph 6.1.2) and record the line level.

Step 2. If the audio line has previously been equalized, proceed to Step 3. If the line has not been equalized, perform the line equalization procedure (paragraph 6.3).

Step 3. With no carrier input, squelch the receiver using the SQUELCH control on the audio control module.

Step 4. Place the OFF-A-B switch on the voting module in the A position; the A light should illuminate.

Step 5. Adjust the LEVEL A control (R74) on the voting module for a level 10 dB below the 1000 Hz level recorded in Step 1.

Step 6. Place the OFF-A-B switch in the B position; the B light should illuminate.

Step 7. Adjust the LEVEL B control (R35) on the voting module for a level 10 dB below the 1000 Hz level recorded in Step 1.

Step 8. Place the NORMAL-TEST switch in the NORMAL position. The receiver's voting level may be monitored by leaving the OFF-A-B switch in either the A or B position, otherwise place this switch in the OFF position.

Step 9. In "Private-Line" systems place the DISABLE switch to the left (on position).

6.6 IMTS SYSTEM APPLICATIONS ONLY

The following procedure is for IMTS systems using dc control. Refer to Instruction Manual 68P81033E25 for IMTS systems using tone control.

Step 1. Apply an unmodulated 1000 uV carrier frequency signal to the antenna input of the receiver.

Step 2. Connect a voltmeter between pin 9 and pin 1 (ground) of the RQS detector module.

Step 3. Connect a milliammeter in series with the 600 ohm line.

Step 4. Adjust the LEVEL SET 1 and LEVEL SET 2 potentiometers, on the RQS detector module, counterclockwise until a maximum output is indicated on the voltmeter.

Step 5. Adjust the LINE CURRENT ADJ. potentiometer until 10.2 mA is obtain as a reading on the milliammeter.

Step 6. Reduce the quieting for 20 dBq (C-message weighted) on the 600 ohm line.

Step 7. Set the DISABLE 1 switch to the right and adjust LEVEL SET 1 potentiometer for 7.3 mA on the line.

Step 8. Release DISABLE 1 and set DISABLE 2 to the right. Adjust LEVEL set 2 potentiometer for 7.3 mA on the line.

Step 9. Release the DISABLE 2 switch.

Step 10. The final level current should be 7.6 mA. If it is not, repeat Steps 6 through 9 to yield 7.6 mA out as the final current.

Step 1. Remove the milliammeter and voltmeter from the 600 ohm line.

7. METER READING LOG

After initial installation adjustments, check values at each meter position and enter the values in the INSTALLATION column of Table 2. Use the remaining columns to log values measured during periodic inspections. Readings in the log are taken with no signal input to the receiver.

8. SERVICE AIDS

8.1 The Extractor Tool (Motorola Part No. 66-83574F01) is designed to aid the serviceman in removing plug-in modules from the card cage. If the module cannot be removed by hand, use the Extractor Tool to disengate the module. Do not attempt to pry the module out with a screwdriver or any other tool as this will damage the module package. An extractor tool is supplied with each voting or satellite receiver. The additional service aids listed in the paragraphs below are available from any Motorola parts facility.

8.2 The Tuning Tool (Motorola Part No. 66-84387C01) is specially designed for adjustments used to align the RF-I-F board.

8.3 An extender board (Motorola Part No. 1-80700B25) permits access to a plug-in module while it is still electrically connected to the main unit.

8.4 The Pot Core Tuning Tool, Motorola Part No. 66-84230K02 permits adjustment of the Status Tone frequency.

Table 2. Meter Reading Log

METER POS.	CIRCUIT METERED	TYPICAL VALUES LO	MID	HI	UHF	INSTALLATION 800 MHz	DATE:	DATE	DATE	DATE	DATE	DATE	DATE
1	UHF-CHANNEL ELEMENT OUTPUT				15	10							
2	FIRST DOUBLER OUTPUT-UHF				15	15							
3	CHANNEL ELEMENT OUTPUT (2ND DOUBLER-UHF)	25 min. 45-50 MHz / 20 min. 25-42 MHz	25 min	15	15	20							
4+,4-	DISCRIMINATOR OUTPUT	0 ±2	0 ±2	0 ±2	0 ±2	0 ±2							
5	3RD IF AND LIMITER	2-10	2-10	1 or less *	10	10							

*If unreadable, inject maximum on channel signal at antenna receptacle; 20 mA, typical should be obtained.

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

RECEIVER HOUSING ASSEMBLY

MODEL TLN1991A

RECEIVER SHIELD KIT

MODEL TRN6825A

MODEL COMPLEMENT

NUMBER	DESCRIPTION
TLN1991A RECEIVER HOUSING ASSEMBLY	
TRN8539A	Chassis and Hardware Kit
TRN8538A	Receiver Interconnect Board
TRN6090A	Module Interconnect Board
TKN8000A	Cable Kit
TRN6825A RECEIVER SHIELD KIT	
1 80779B67	Receiver Front Cover
1 80799B72	Receiver Back Cover

1. DESCRIPTION

1.1 The TLN1991A Receiver Housing Assembly consists of a wraparound chassis, two interconnect boards, and a cable to provide connections between the interconnect boards (see figure 1). The receiver rf and i-f amplifier board mounts in the left side of the housing and plugs into the receiver interconnect board. The receiver interconnect board is connected to a module interconnect board which is mounted on the right-rear of the housing. This forms a card cage for the plug-in modules.

1.2 The audio control module plugs into the first slot to the right of the receiver rf and i-f board, an optional coded squelch (tone or digital) into the second slot, the receiver encoder (tone voting) module into the third slot, and an optional receiver service module into the fourth (last) slot. The power supply mounts in the rear of the housing behind the rf and i-f board.

1.3 The receiver shield kit consists of two cover (shield) plates. One plate mounts of the front of the housing to cover the rf and i-f section. The second plate mounts on the rear of the housing to cover the power supply.

2. INTERCONNECTION

2.1 INTERNAL CONNECTIONS
(Refer to figure 2)

All internal connections are made at the factory, including any factory installed options. When an optional receiver service kit is to be added in the field, install the receiver service kit as outlined in the Installation section of this manual. Figure 2 shows all intercabling for the receiver. Refer to the receiver and module interconnect circuit board details in this section for detailed wiring and interconnect data.

2.2 EXTERNAL CONNECTIONS

Normally, the only external connections required are audio line, antenna, and ac power. The audio line connections are made to the LINE 1 (+)

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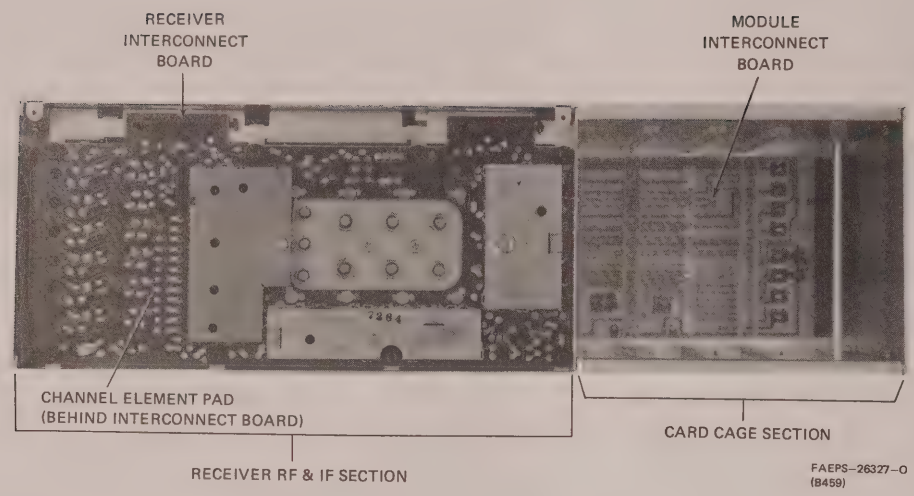
68P81039E17-A
6/12/81-UP



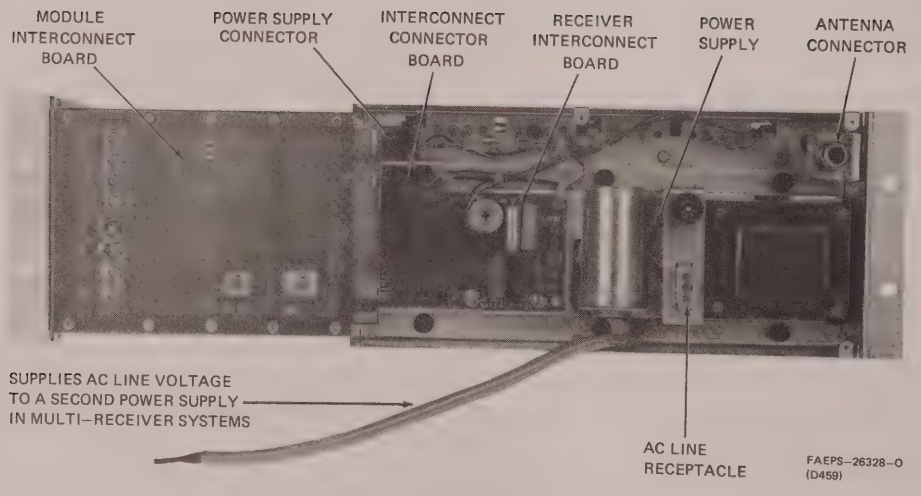


Figure 1. Receiver Housing Assembly

and (-0 terminals on the module interconnect board. The antenna is connected to the "N" type connector at the rear of the housing. The ac power source is connected either to the junction box (voting receivers) or to the ac cord (satellite receivers). For all external connection details, refer to the Installation section of this manual.

3. REFERENCE DIAGRAMS

TRN8538A Receiver Interconnect Board, Schematic Diagram and Circuit Board Detail PEPS-18006

TRN6090A Module Interconnect Board, Circuit Board Detail PEPS-18007

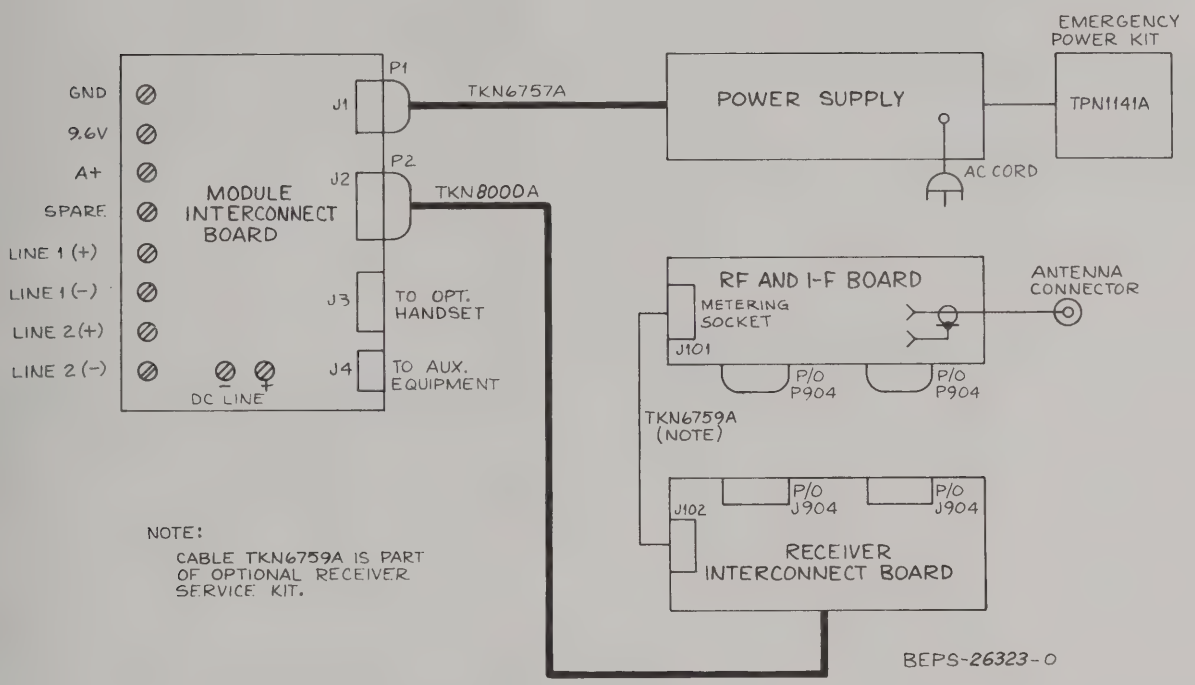


Figure 2. Receiver Interconnection Diagram

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCR

PARTS LIST

TRN8538A Receiver Interconnect Board

		CAPACITOR,
C1	21-82812H02	470 pF; GMV;
		DIODE: (SEE I
CR1	48-83654H01	silicon
		FILTER:
FL1-FL12	91-87511C01	RF1
		CONNECTOR,
J102	9-84207B01	female; 7-cont
J904		consists of:
	9-83697M01	CONTACT,
NON-REFERENCED PARTS		
	7-82194M01	BRACKET, fil
	14-84966D01	INSULATOR,
	4-83755M01	WASHER, sho
	3-139028	SCREW, mach
		3 used

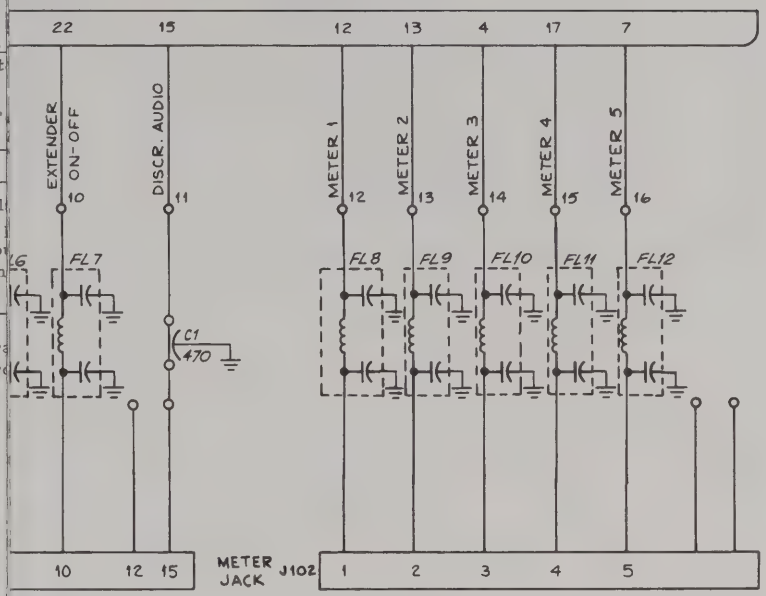
NOTE: For optimum performance, diodes tra
integrated circuits must be ordered by Motor

TRN8540A Receiver RF Shield (UHF)

	1-80708D69	COVER & INSU
	26-84794L01	SHIELD
	55-84300B01	HANDLE: 2 us
	3-134186	SCREW, tappi

TKN6999A Antenna Cable (800 MHz)

	9-83213K01	CONNECTOR,
	28-87317C01	CONNECTOR
	7-83654K01	BRACKET, an
	29-835985	LUG, solder
	30-84173E01	CABLE, coaxi
		14" used
	3-134169	SCREW, tappi
		4 used
	3-134186	SCREW, tappi
		2 used



CEPS-26324-A

RECEIVER HOUSING ASSEMBLY & SHIELD KIT

TRN8538A-1 Receiver Interconnect Board
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-26330-B
7/15/81- UP

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION

PARTS LIST

TRN8538A Receiver Interconnect Board PL-6045-A

C1	21-82812H02	CAPACITOR, feed-thru: 470 pF; GMV; 500 V
CR1	48-83654H01	DIODE: (SEE NOTE) silicon
FL1-FL12	91-87511C01	FILTER: RFI
J102	9-84207B01	CONNECTOR, receptacle: female; 7-contact
J904		consists of:
	9-81697M01	CONTACT, female; 16 used
NON-REFERENCED PARTS		
	7-82194M01	BRACKET, filter mounting
	14-84966D01	INSULATOR, pc board; 4 used
	4-83755M01	WASHER, shoulder
	3-139028	SCREW, machine: 4-24 x 5/16; 3 used

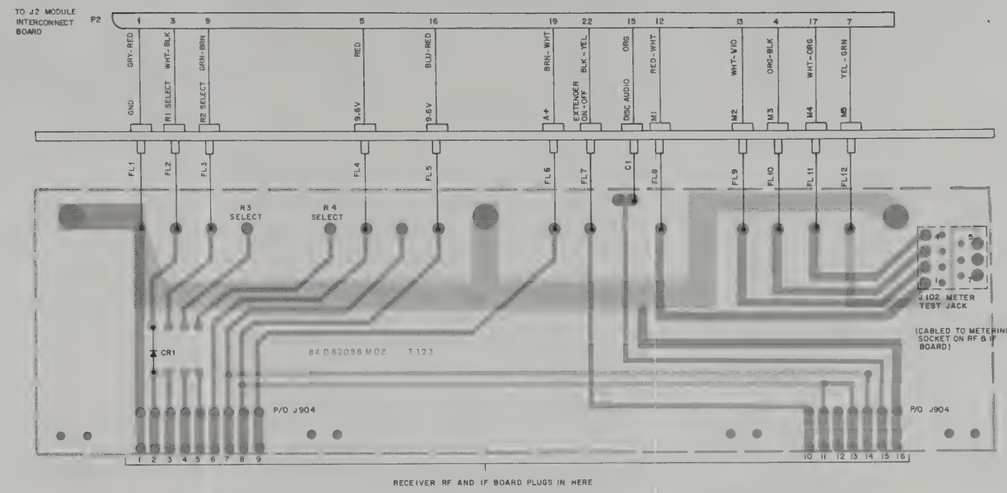
NOTE: For optimum performance, diodes transistors and integrated circuits must be ordered by Motorola part numbers.

TRN8540A Receiver RF Shield (UHF) PL-6046-O

	1-80708D69	COVER & INSULATOR ASSY.
	26-84794L01	SHIELD
	55-84300B01	HANDLE: 2 used
	3-134186	SCREW, tapping: 6-32 x 5/16"

TKN6999A Antenna Cable (800 MHz) PL-6047-O

	9-83213K01	CONNECTOR, "N" type
	28-87317C01	CONNECTOR
	7-83654K01	BRACKET, antenna mounting
	29-835985	LUG, solder
	30-84173E01	CABLE, coaxial: double-shield; 14" used
	3-134169	SCREW, tapping: 4-40 x 1/4"; 4 used
	3-134186	SCREW, tapping: 6-32 x 5/16"; 2 used



SHOWN FROM SOLDER SIDE

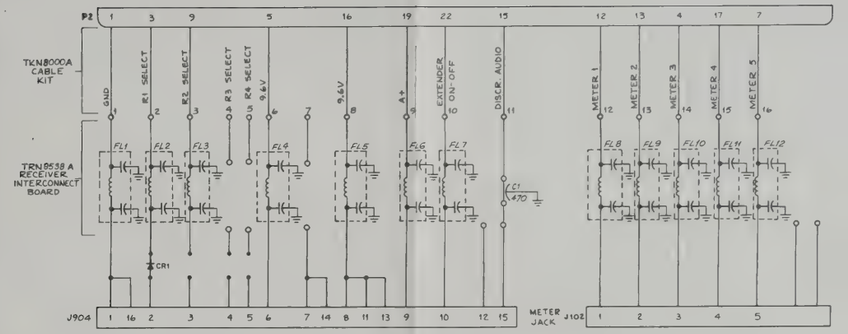
SOLDER SIDE ● 80-CEPS-30251-O
COMPONENT SIDE ○ 80-CEPS-30252-O
OL CEPS-26322-A

TKN6998A Antenna Cable (VHF, UHF) PL-6048-O

	1-80708D65	CABLE ASSY. includes:
	9-83213K01	CONNECTOR, "N" type
	28-82331G02	CONNECTOR, plug: single contact
	29-835985	LUG, solder
	30-84173E01	CABLE, coaxial: double-shield 13-1/2" used
	7-83654K01	BRACKET, antenna mounting
	3-134169	SCREW, tapping: 4-40 x 1/4"; 4 used
	3-134186	SCREW, tapping: 6-32 x 5/16"; 2 used

REVISIONS PEPS-26330-A

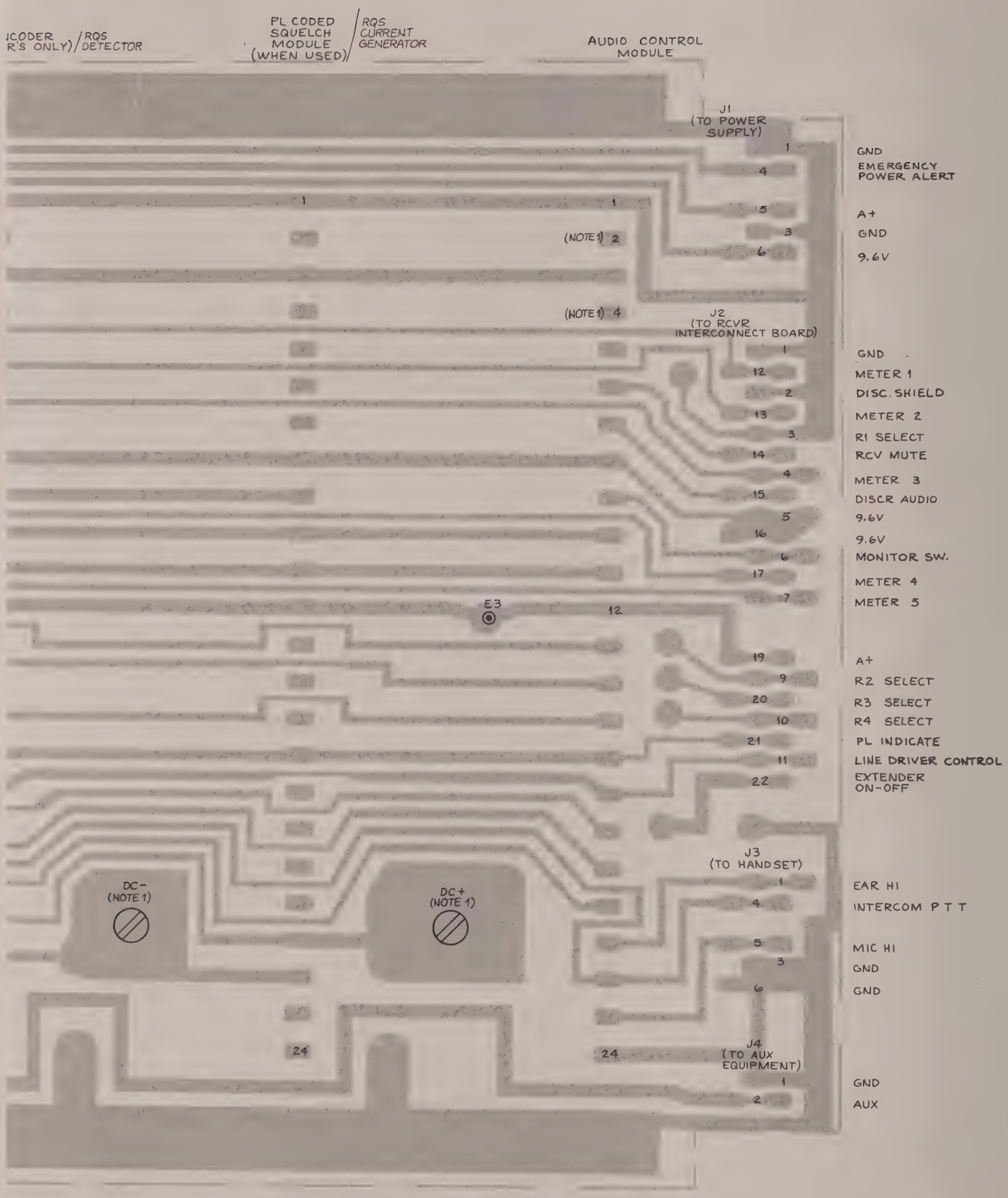
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN8538A-1	CR1	ADDED PRINTED CIRCUIT BOARD CHANGED FROM 84D82088M01 TO 84D82088M02	J904, PIN 2



CEPS-26324-A

RECEIVER HOUSING ASSEMBLY & SHIELD KIT

TRN8538A-1 Receiver Interconnect Board
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-26330-B
7/15/81- UP



SOLDER SIDE BD-DEPS-18003-0
OL-DEPS-18004-A

SIDE

NOTE
1. IF DC IS TO BE SUPERIMPOSED ON THE AUDIO SIGNAL, CONNECT DC+ TO PIN 2 AND DC- TO PIN 4 OF THE AUDIO CONTROL MODULE.

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6090A Module Interconnect Board PL-3465-O

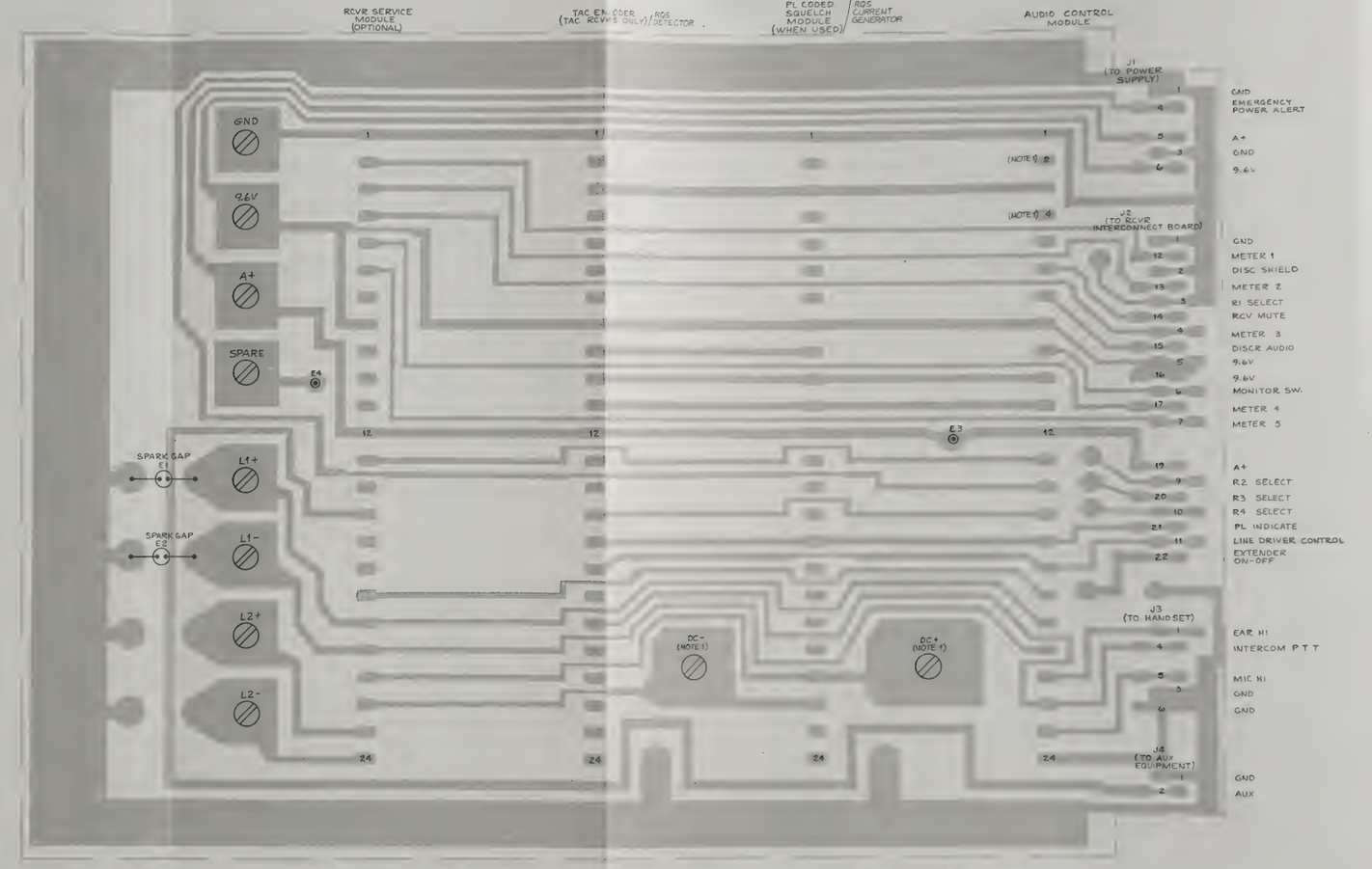
E1, 2	80-83029H03	SPARK GAP: 90 volts; coded RED
NON-REFERENCED ITEMS		
	28-84269C01	CONNECTOR, male: (0.745) 17 req'd.
	28-84269C02	CONNECTOR, male: (0.640) 15 req'd.
	29-83362G01	TERMINAL, 10 req'd.
	29-84028H09	TERMINAL; male: pin type; 96 req'd.
	39-10184A10	CONTACT, chain form; 2 req'd.

TRN6090A Module Interconnect Board
Circuit Board Detail
Motorola No. PEPS-18007-A
9/15/77- UP

MODULE INTERCONNECT FUNCTION TABLE

FUNCTION	SERVICE MODULE	TAC ENCODER	PL CODED SQUELCH MODULE	AUDIO CONTROL	J1	J2	J3	J4
GROUND	1	1	1	1, 24	1, 3	1, 2	3, 6	1
METER 1	2					12		
METER 2	3					13		
METER 3	4					4		
METER 4	5					17		
METER 5	6					7		
9.6	8	8	8	8	6	5, 16		
LOCAL AUDIO	18			18				
LINE 1+	19			19				
LINE 1-	20			20				
DC+	21		21					
DC-	22		22					
LINE 2+	23							
LINE 2-	24							
A+	12	12	12	12	5	19		
LINE AUDIO	13			13				
AMPLIFIED DISCRIMINATOR		3	3	3				
RCVR MUTE								
DISCRIMINATOR IN								
MONITOR SWITCH				9		6		
DISCRIMINATOR OUT-		10	10	10				
EMERGENCY POWER ALERT (EPA)				14	4			
STATUS TONE		15		15				
PL INDICATE		16	16	16		21		
LINE DRIVER CONTROL		17		17		11		
EAR #1				21			1	
INTERCOM P-T-T		19		22			4	
MIC HI				23			5	
NOT USED		9	9					
AUX	15							2
R1 SELECT						3		
R2 SELECT						9		
R3 SELECT						20		
R4 SELECT						10		
RCVR UNSQUELCH INDIC		11	11	11				

EPS-18005-O



SHOWN FROM SOLDER SIDE

NOTE
1. IF DC IS TO BE SUPERIMPOSED ON THE AUDIO SIGNAL, CONNECT DC+ TO PIN 2 AND DC- TO PIN 4 OF THE AUDIO CONTROL MODULE.

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

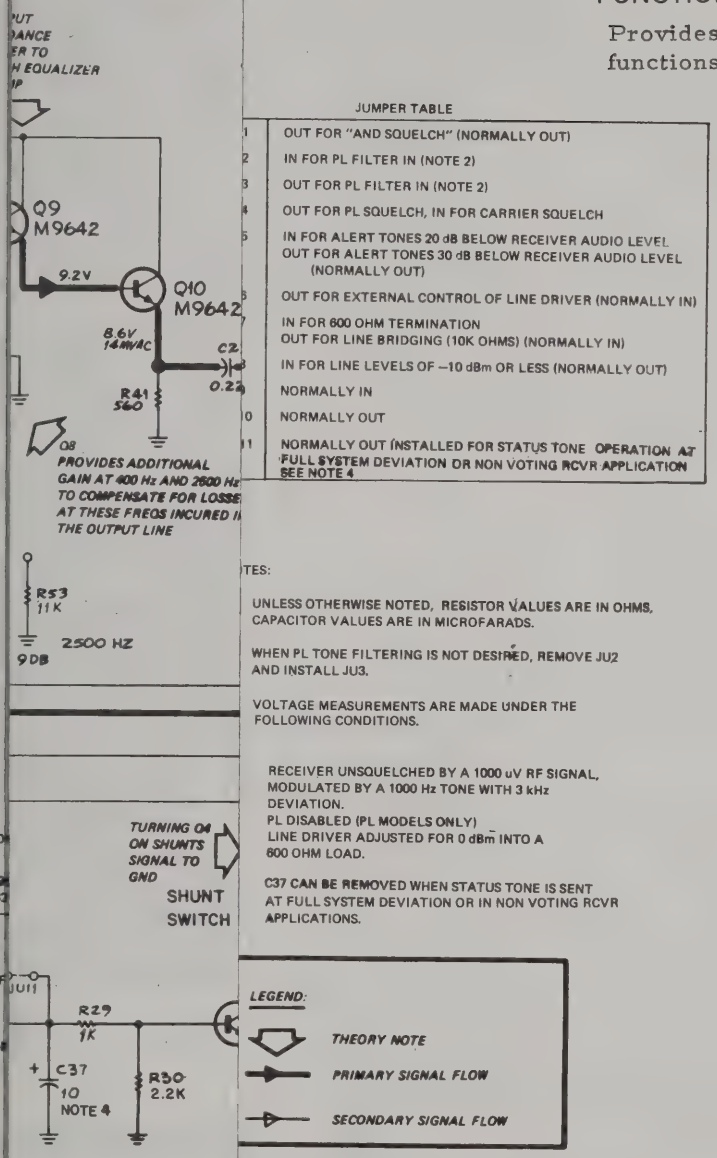
POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

AUDIO CONTROL MODULE

MODELS TRN6080B AND TRN6956A

FUNCTION

Provides audio amplification and squelch control functions.



JUMPER TABLE

1	OUT FOR "AND SQUELCH" (NORMALLY OUT)
2	IN FOR PL FILTER IN (NOTE 2)
3	OUT FOR PL FILTER IN (NOTE 2)
4	OUT FOR PL SQUELCH, IN FOR CARRIER SQUELCH
5	IN FOR ALERT TONES 20 dB BELOW RECEIVER AUDIO LEVEL OUT FOR ALERT TONES 30 dB BELOW RECEIVER AUDIO LEVEL (NORMALLY OUT)
6	OUT FOR EXTERNAL CONTROL OF LINE DRIVER (NORMALLY IN)
7	IN FOR 600 OHM TERMINATION OUT FOR LINE BRIDGING (10K OHMS) (NORMALLY IN)
8	IN FOR LINE LEVELS OF –10 dBm OR LESS (NORMALLY OUT)
9	NORMALLY IN
10	NORMALLY OUT
11	NORMALLY OUT (INSTALLED FOR STATUS TONE OPERATION AT FULL SYSTEM DEVIATION OR NON VOTING RCVR APPLICATION SEE NOTE 4

NOTES:

UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.

WHEN PL TONE FILTERING IS NOT DESIRED, REMOVE JU2 AND INSTALL JU3.

VOLTAGE MEASUREMENTS ARE MADE UNDER THE FOLLOWING CONDITIONS.

RECEIVER UNSQUELCHED BY A 1000 uV RF SIGNAL, MODULATED BY A 1000 Hz TONE WITH 3 kHz DEVIATION.
PL DISABLED (PL MODELS ONLY)
LINE DRIVER ADJUSTED FOR 0 dBm INTO A 600 OHM LOAD.

C37 CAN BE REMOVED WHEN STATUS TONE IS SENT AT FULL SYSTEM DEVIATION OR IN NON VOTING RCVR APPLICATIONS.

LEGEND:

- THEORY NOTE
- PRIMARY SIGNAL FLOW
- SECONDARY SIGNAL FLOW

AUDIO CONTROL MODULE

MODELS TRN6080B AND TRN6956A

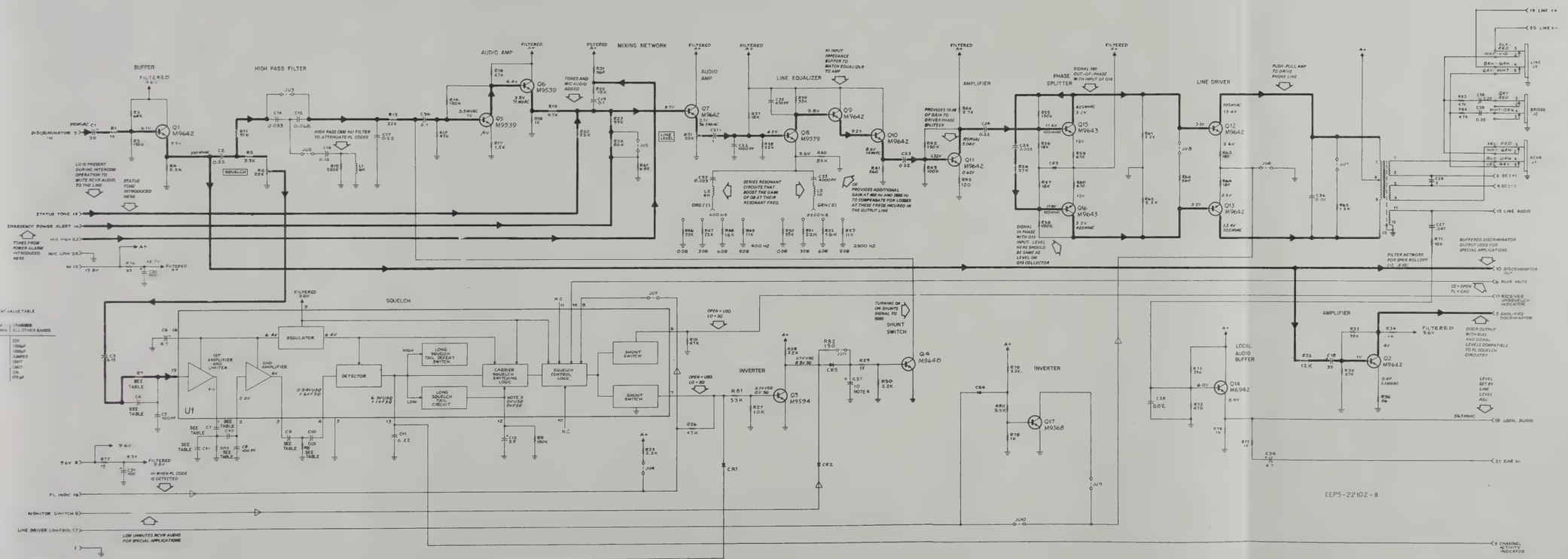
FUNCTION

Provides audio amplification and squelch control functions.

JUMPER TABLE	
JU1	OUT FOR "AND SQUELCH" (NORMALLY OUT)
JU2	IN FOR PL FILTER IN (NOTE 2)
JU3	OUT FOR PL SQUELCH; IN FOR CARRIER SQUELCH
JU5	IN FOR ALERT TONES 20 dB BELOW RECEIVER AUDIO LEVEL; OUT FOR ALERT TONES 30 dB BELOW RECEIVER AUDIO LEVEL (NORMALLY OUT)
JU6	OUT FOR EXTERNAL CONTROL OF LINE DRIVER (NORMALLY IN)
JU7	IN FOR 600 OHM TERMINATION; OUT FOR LINE BRIDGING (10K OHMS) (NORMALLY IN)
JU8	IN FOR LINE LEVELS OF −10 dBm OR LESS (NORMALLY OUT)
JU9	NORMALLY IN
JU10	NORMALLY OUT
JU11	NORMALLY OUT INSTALLED FOR STATUS TONE OPERATION W2 FULL SYSTEM DEVIATION OR NON VOTING RCVR APPLICATION SEE NOTE 4

NOTES:

1. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
2. WHEN PL TONE FILTERING IS NOT DESIRED, REMOVE JU2 AND INSTALL JU3.
3. VOLTAGE MEASUREMENTS ARE MADE UNDER THE FOLLOWING CONDITIONS:
   - A. RECEIVER UNSQUELCHED BY A 1000 uV RF SIGNAL MODULATED BY A 1000 Hz TONE WITH 3 kHz DEVIATION.
   - B. PL DISABLED (PL MODELS ONLY).
   - C. LINE DRIVER ADJUSTED FOR 0 dBm INTO A 600 OHM LOAD.
4. C37 CAN BE REMOVED WHEN STATUS TONE IS SENT AT FULL SYSTEM DEVIATION OR IN NON VOTING RCVR APPLICATIONS.



68P81036E23-C
(Sheet 1 of 2)
6/12/81- UP

PARTS LIST

TRN6080B and TRN6956A Audio Control Module PL-5530-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±5%; 50 V; unless otherwise stated
C1,18	23-82783B36	39 ±10%; 10 V
C2,11,17,23, 24,38,39	8-83813H11	0.22 ±10%; 75 V
C3	8-82905G05	0.15
C4	21-84426B63	1500 pF; 100 V
C4	21-84494B22	750 pF; ±5%; 300 V (TRN6956A only)
C5,8	21-84426B06	100 pF; 500 V
C6,34	23-84762H07	4.7 ±20%; 10 V
C7	21-84493B05	1000 pF ±10%; 200 V
C7	8-82905G25	.0033; 100 V (TRN6956A only)
C9	21-84426B11	470 pF; ±1%; 500 V
C9	21-863296	2500 pF ±2%; 500 V (TRN6956A only)
C10,26	8-83813H31	.01 ±10%; 100 V
C12	23-84762H08	3.9 ±20%; 15 V
C13		NOT USED
C14,25	8-82905G16	.033; 100 V
C15	8-82905G04	.068
C16	8-82905G09	0.12
C19,36	8-83514E02	0.1 ±10%
C21	23-83214C04	1.0 ±20%; 15 V
C22	21-82187B29	.001 ±10%; 100 V
C27	8-82905G03	.047
C28	8-83813H18	.02
C29	8-82045F05	2 ±10%; 350 V
C30,31	23-84669A19	100 ±20%; 25 V
C32	8-82905G39	.023
C33	21-863396	4000 pF ±1%; 500 V
C35	21-82187B07	470 pF ±10%; 500 V
C37	23-83214C20	10 ±10%; 20 V
C40	21-874354	5100 pF ±5%; 300 V (TRN6956A only)
C41	8-82905G15	.015; 100 V (TRN6956A only)
		DIODE: (SEE NOTE)
CR1 thru 5	48-83654H01	silicon
		JACK:
J1 thru J3	9-83073L02	
		COIL, RF:
L1,2	24-84003A01	choke; 6H
L3	25-82113H02	choke; 1H
		TRANSISTOR: (SEE NOTE)
Q1,2	48-869642	NPN; type M9642
Q3	48-869594	NPN; type M9594
Q4	48-869648	NPN; type M9648
Q5,6,8	48-869539	NPN; type M9539
Q7,9 thru 14	48-869642	NPN; type M9642
Q15,16	48-869643	PNP; type M9643
Q17	48-869568	NPN; type M9568
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R1,18,34,74 75,78,29	6-11009C49	1k
R2	6-11009C93	68k
R3,14,42,55, 58	6-11009D02	150k
R4,25,28,61, 62,30	6-11009C57	2.2k
R5,79,80	6-11009C61	3.3k
R6,31	18-83518L02	var; 25k
R7,13,20,38, 47,51	6-11009C81	22k
R7	6-11009C85	33k (TRN6956A only)
R8,35,54	6-11009C83	27k
R8	6-11009C65	4.7k (TRN6956A only)
R9	6-11009D04	180k
R10,15,73,26	6-11009C89	47k
R11,16,27,29, 71	6-11009C73	10k
R12	6-11009D06	220k
R17	6-11009D10	330;
R19,83,84	6-11009C65	4.7k
R21	6-125A43	560; 1/2 W
R22	6-11009C77	15k
R23,33,72,50	6-11009C87	39k
R24,40	6-11009C95	82k
R32	6-11009C75	12k
R36	6-11009C19	56
R37,56,57	6-11009C79	18k
R39,46,81	6-11009C85	33k
R41,66	6-11009C43	560
R43	6-11009C97	100k
R44	6-11009C59	2.7k
R45	6-11009C31	180
R48,52	6-11009C78	16k
R49,53	6-11009C74	11k
R59,60	6-11009C41	470
R63,64	6-11009C31	180
R65	6-11009C51	1.2k
R67	6-11009C69	6.8k
R76	6-125A13	33; 1/2 W
R77	6-125A05	15; 1/2 W
R82	6-11009C29	150;
R85	6-11009C53	1.5k (TRN6956A or
		TRANSFORMER:
T1	25-83036L01	pri: pins 7 and 9; res 2 sec: pins 1 and 2; res 2 pins 3 and 4; res 2 pins 11 and 12; res
		INTEGRATED CIRCUIT
U1	51-84561L79	NOTE) type SC6709
		NON-REFERENCED ITEMS
	37-82603D01	SLEEVING: coded #1
	37-82603D02	SLEEVING: coded #2
	39-10184A24	CONTACT, chainform;
	64-83163L07	PANEL
	9-83011H01	RECEPTACLE, female 24 req'd.
	43-865080	BUSHING; 2 req'd.

NOTE:
For optimum performance, diodes, transistors, and in
circuits must be ordered by Motorola part numbers.

REVISIONS 68P81036

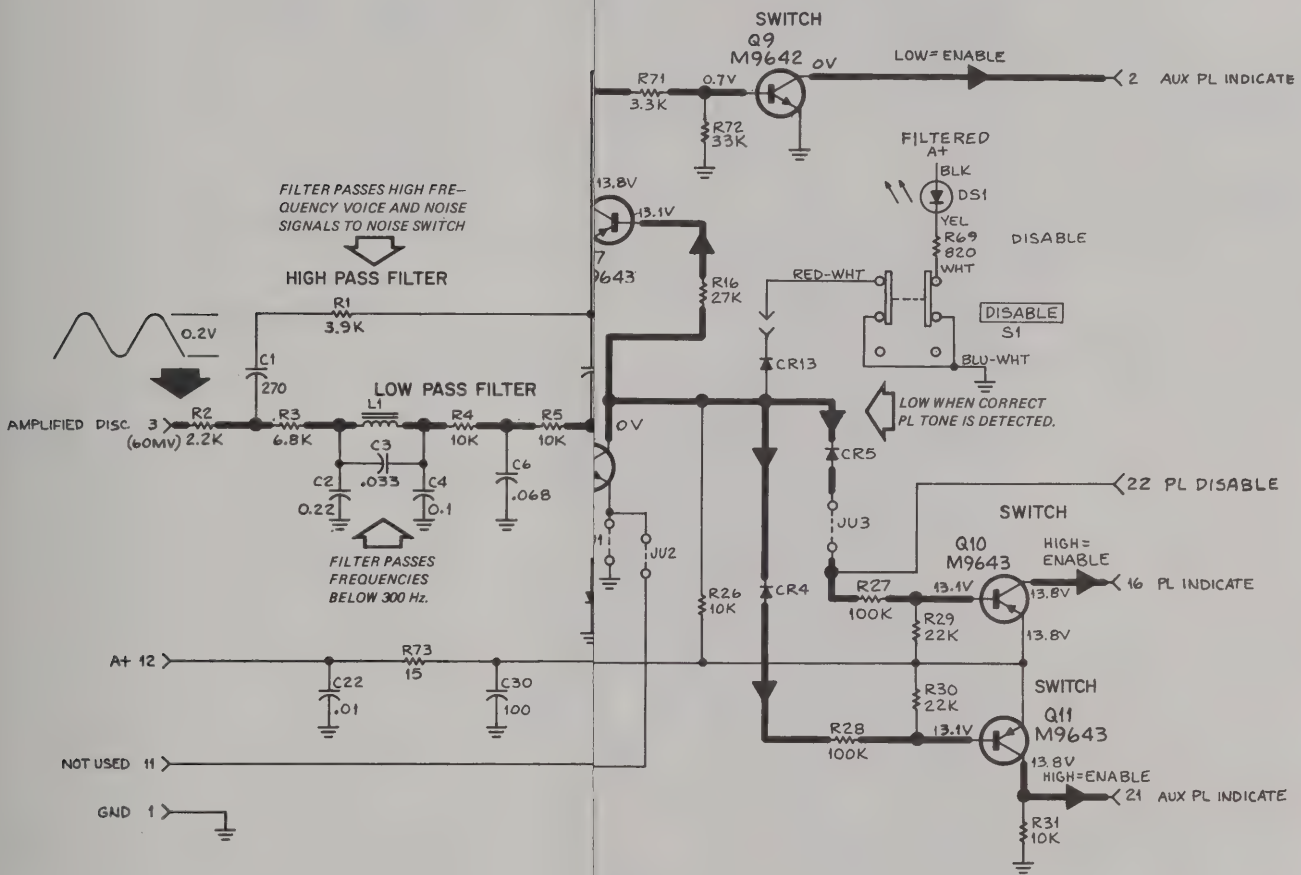
CHASSIS AND SUFFIX NO.	REF SYMBOL	CHANGE	LOCATION
TRN6080B AND TRN6956A	R45	FROM 6-124A35 270 TO 6-11009C31, 180	Q11 AMPLI
		UP-DATE RESISTOR PART NUMBERS	

TONE "PRIVATE-LINE" DECODER

MODEL TRN6083A

FUNCTION

Provides outputs to enable receiver audio when proper tone PL code is received.



AUDIO CONTROL MODULE

MODELS TRN6080B AND TRN6956A

AUDIO CONTROL MODJLE TROUBLESHOOTING CHART

1. PLACE AUDIO CONTROL BOARD ON THE EXTENDER CARD AND REINSERT INTO CARD CAGE.
2. INJECT A 1000 uV RF SIGNAL, MODULATED WITH 1 kHz WITH ±3 kHz DEVIATION, INTO THE ANTENNA CONNECTION OF THE RECEIVER.
3. TURN THE SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
4. FOR PL SQUELCH RECEIVERS, DISABLE PL SQUELCH.

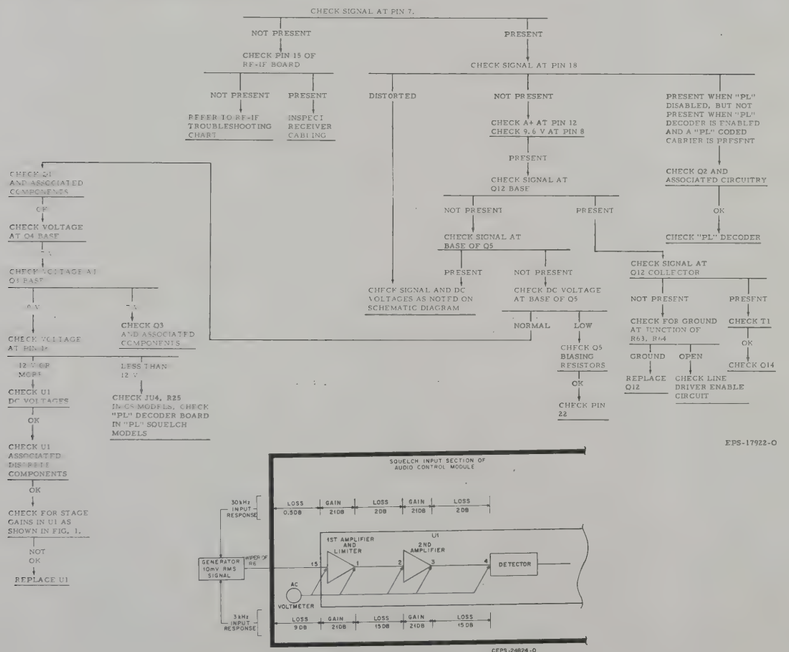
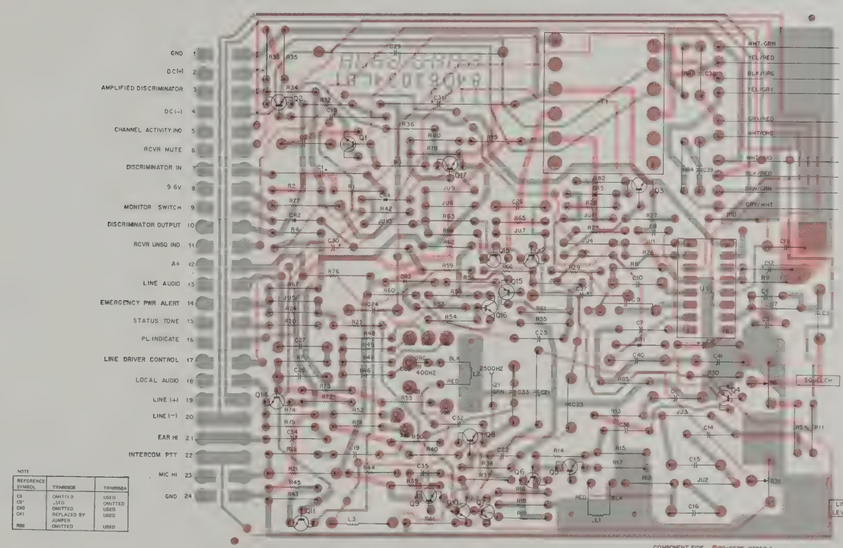


Figure 1. TRN 6080B Squelch Imput Stage Gains



REFERENCE SYMBOL	TRN6080B	TRN6956A
C6	OMITTED	USED
C9	OMITTED	OMITTED
D40	OMITTED	USED
Q41	REPLACED BY JUMPER	USED
R89	OMITTED	USED

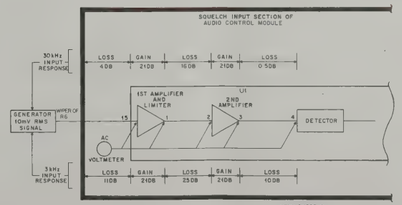


Figure 2. TRN6956A Squelch Input Stage Gains

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6080B and TRN6956A Audio Control Module PL-DEPS-23850-A

		CAPACITOR, fixed: uF ±5%;
C1,12, 44,46,47, 48,50,52	21-82738B04	15 uF, 10 V
C3	8-82905G05	0.15
C4	21-84426B06	100 pF, 500 V
C5,8	21-84433B05	1000 pF ±10%, 200 V
C10,26	8-83813H13	.01 ±10%, 100 V
C12	23-84762H08	3, 9 ±20%, 15 V
C13		NOT USED
C15	8-82905G04	.068
C19,36	8-83148D07	0.1 ±10%
C22	21-82187B29	.001 ±10%, 100 V
C27	8-82905G03	.047
C41	8-82905G15	.015; 100 V (TRN6956A only)
CR1 thru 4	48-869842	DIODE: SILICON;
J1	7-8307130	JACK:
L1,2	24-84083A01	CORE, RF
L3	24-84211H02	choke, rf
Q1,2	48-869842	TRANSISTOR: SEE NOTE
Q3	48-869964	NPN; type M9642
Q4	48-869648	NPN; type M9594
Q5	48-869494	NPN; type M9648
Q7,9 thru 14	48-869842	NPN; type M9642
Q15,16	48-869643	PNP; type M9643
Q17	48-869568	NPN; type M9568
R1,15,34,74, 75,78,29	6-11009C93	RESISTOR, fixed: ±5%, 1/4 W unless otherwise stated
R2	6-11009C93	68k
R3,14,42,55, 58	6-11009D02	150k
R4,25,28,61, 62,30	6-11009C57	2.2k
R5,79,80	6-11009C61	4.3k
R6,31	18-83518L02	var, 25k
R7,13,20,38, 47,51	6-11009C81	22k
R7	6-11009C85	33k (TRN6956A only)
R8,35,54	6-11009C83	27k
R8	6-11009C65	5.6k (TRN6956A only)
R9	6-11009D04	180k
R10,15,73,26	6-11009C89	47k
R11,16,27,29, 71	6-11009C73	10k
R12	6-11009D06	220k
R17	6-11009D10	330;
R19,83,84	6-11009C65	4.7k
R21	6-125A43	560; 1/2 W
R22	6-11009C77	15k
R24,40	6-11009C95	82k
R26	6-11009C97	91k
R27	6-11009C99	1k
R39,46,81	6-11009C85	33k
R43	6-11009C91	68k
R44	6-11009C93	100k
R45	6-11009C95	120k
R48,52	6-11009C78	16k
R49,56	6-11009C77	15k
R50	6-11009C97	1M
R53,54	6-11009C49	10k (TRN6956A only)
R57	6-11009C51	1.2k
R59	6-11009C89	47k
R70	6-125A13	33; 1/2 W
R72	6-11009C97	1M
R82	6-11009C97	1M
R85	6-11009C49	10k (TRN6956A only)
T1	25-830361L01	TRANSFORMER: pri: pins 7 and 9; res 2 sec: pins 1 and 2; res 2 pins 3 and 4; res pins 11 and 12; res
U1	51-845611L79	INTEGRATED CIRCUIT: NOTE: type SCL4709
		NON-REPLACEABLE ITEMS
	37-84043D01	SLEEVING: coded #1
	37-84043D02	SLEEVING: coded #2
	39-10184A24	CONTACT, chassis/rear PANEL
	64-83103L07	RECEPTACLE, female; 14 recpts
	43-865080	BUSHING; 2 req'd.

NOTE

For optimum performance, diodes, transistors and integrated circuits must be replaced with exact replacement numbers.

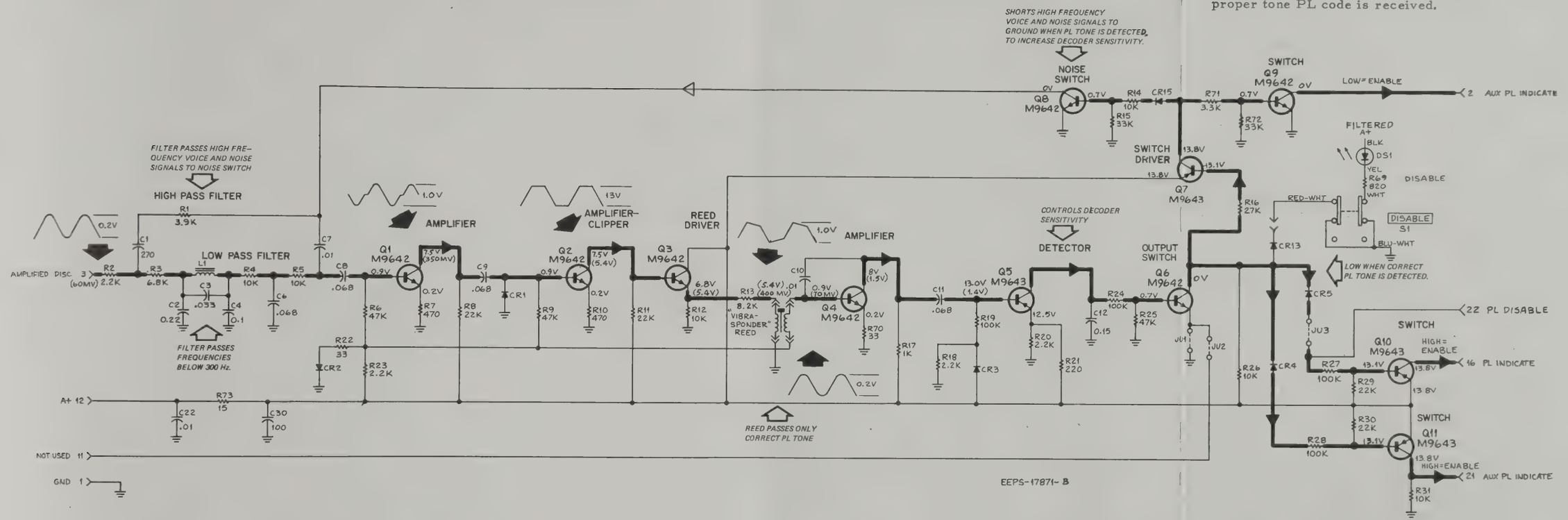
CHASSIS AND BUILT-IN OPTION	REF. SYMBOL	CHANGE
TRN6080B AND TRN6956A	R45	FROM 100 OHMS 5% TO 0.1 OHM 5%, 1W
		TO: DATE RESISTOR

TONE "PRIVATE-LINE" DECODER

MODEL TRN6083A

FUNCTION

Provides outputs to enable receiver audio when proper tone PL code is received.



JUMPER STATUS

JUMPER	FUNCTION
JU1	IN FOR NORMAL PL OPERATION. REMOVED WHEN JU2 IS IN.
JU2	OUT FOR NORMAL PL OPERATION. JU1 IS REMOVED AND JU2 IS ADDED FOR EXTERNAL PL ON-OFF SELECTION.
JU3	IN FOR NORMAL PL OPERATION. REMOVED WHEN PL INDICATE FUNCTION IS NOT DESIRED.

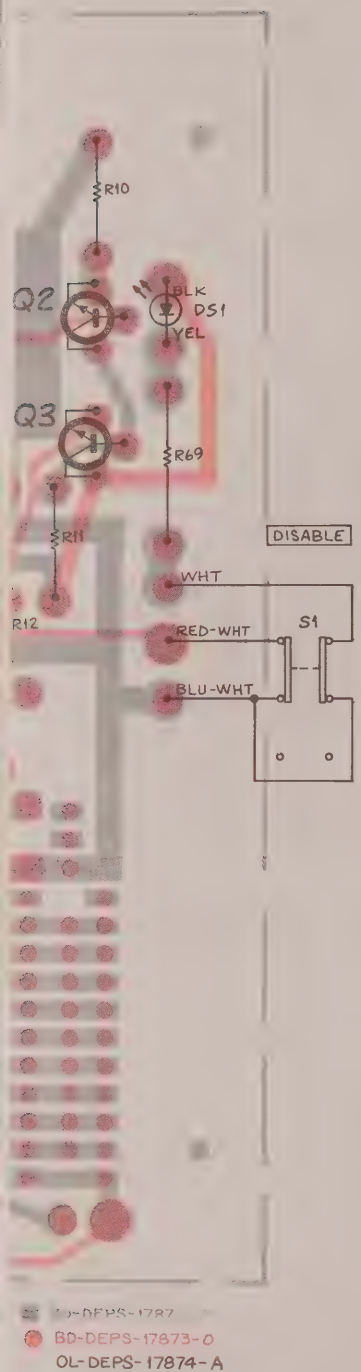
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
2. VOLTAGE READINGS AND WAVEFORMS TAKEN WITH PROPER PL TONE INPUT (PIN 3) AT 60 mV (RMS). AC VOLTAGES ARE SHOWN IN PARENTHESES ( ) BELOW DC VOLTAGES. VOLTAGE READINGS TAKEN WITH METER HAVING 10 MEGOHM INPUT IMPEDANCE.

LEGEND

- THEORY OF OPERATION DATA
- MAINTENANCE DATA
- PRIMARY SIGNAL FLOW
- SECONDARY SIGNAL FLOW

68P81026E26-B
(Sheet 1 of 2)
6/12/81-UP



BD-DEPS-17873-0
OL-DEPS-17874-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6083A "Private-Line" Tone Decoder PL-3479-C

		CAPACITOR, fixed: uF ±5%; 50 V; unless otherwise stated
C1	21-847085	270 pF ±10%; 300 V
C2	8-82905G32	0.22
C3	8-82905G08	.033
C4	8-82905G07	0.1
C6, 8, 9, 11	8-82905G04	.068
C7, 10, 22	21-82428B12	.01 +80-20%; 200 V
C12	8-82905G05	0.15
C30	23-82077C01	100 +150-10%; 35 V
		DIODE: SEE NOTE
CR1 thru 5, 13, 15	48-83654H01	silicon
		LIGHT EMITTING DIODE:
DS1	48-88245C08	coded RED
		COIL, RF:
L1	24-84003A01	choke; 6H
		TRANSISTOR: SEE NOTE
Q1, 2, 3, 4, 6, 8, 9	48-869642	NPN; type M9642
Q5, 7, 10, 11	48-869643	PNP; type M9643
		RESISTOR, fixed: ±5%; 1/4 W: unless otherwise stated
R1	6-124A63	3.9k
R2, 18, 20, 23	6-124A57	2.2k
R3	6-124A69	6.8k
R4, 5, 12, 14, 26, 31	6-124A73	10k
R6, 9, 25	6-124A89	47k
R7, 10	6-124A41	470
R8, 11, 29, 30	6-124A81	22k
R13	6-124A71	8.2k
R15, 72	6-124A85	33k
R16	6-124A83	27k
R17	6-124A49	1k
R19, 24, 27, 28	6-124A97	100k
R21	6-124A33	220
R22, 70	6-124A13	33
R69	6-125A47	820; 1/2 W
R71	6-124A61	3.3k
R73	6-124A05	15
		SWITCH:
S1	40-83204B01	dpdt slide
NON-REFERENCED ITEMS		
	42-84116B01	CLAMP and SOCKET
	43-865080	BUSHING; 2 req'd.
	9-83011H01	RECEPTACLE, board mounting; 24 req'd.
	64-83657K02	PANEL

NOTE:

For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REVISIONS 68P81026E26-B

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6083A	C5	DELETED, WAS 21-82187B26 .003 uF ±10%, 100 V	HIGH-PASS FILTER
		ADDED, PL DISABLE FUNCTION	PIN 22
	R1	FROM 6-124A73; 10k TO 6-124A63; 3.9k	HIGH-PASS FILTER
	R13	FROM 6-124A67, 5.6k TO 6-124A71, 8.2k	REED DRIVER

"DIGITAL PRIVATE-LINE" DECODER

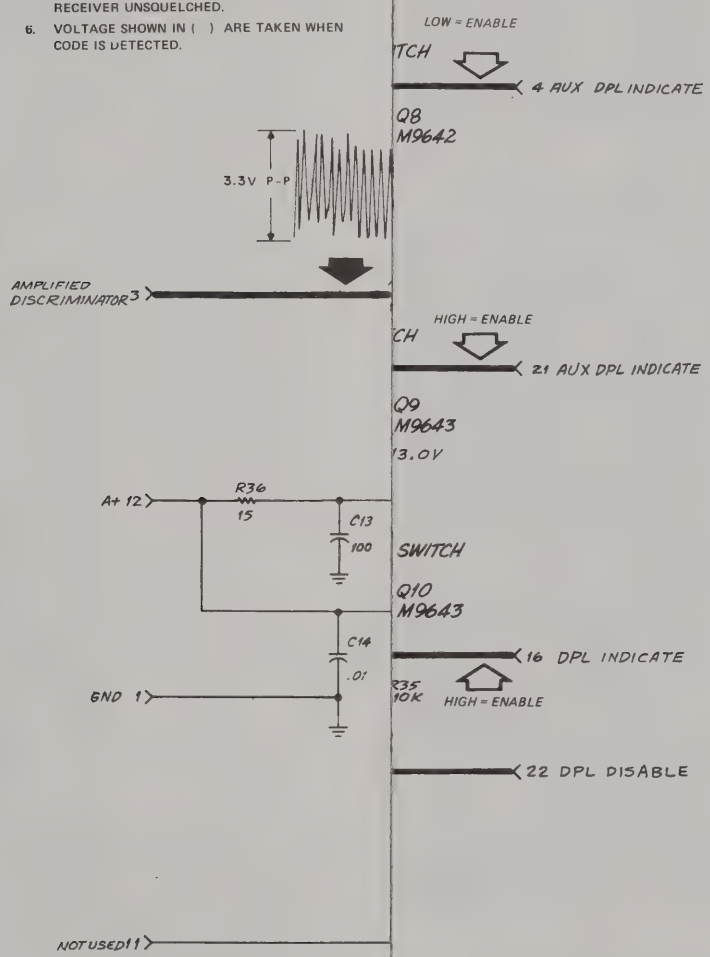
MODEL TRN6082A

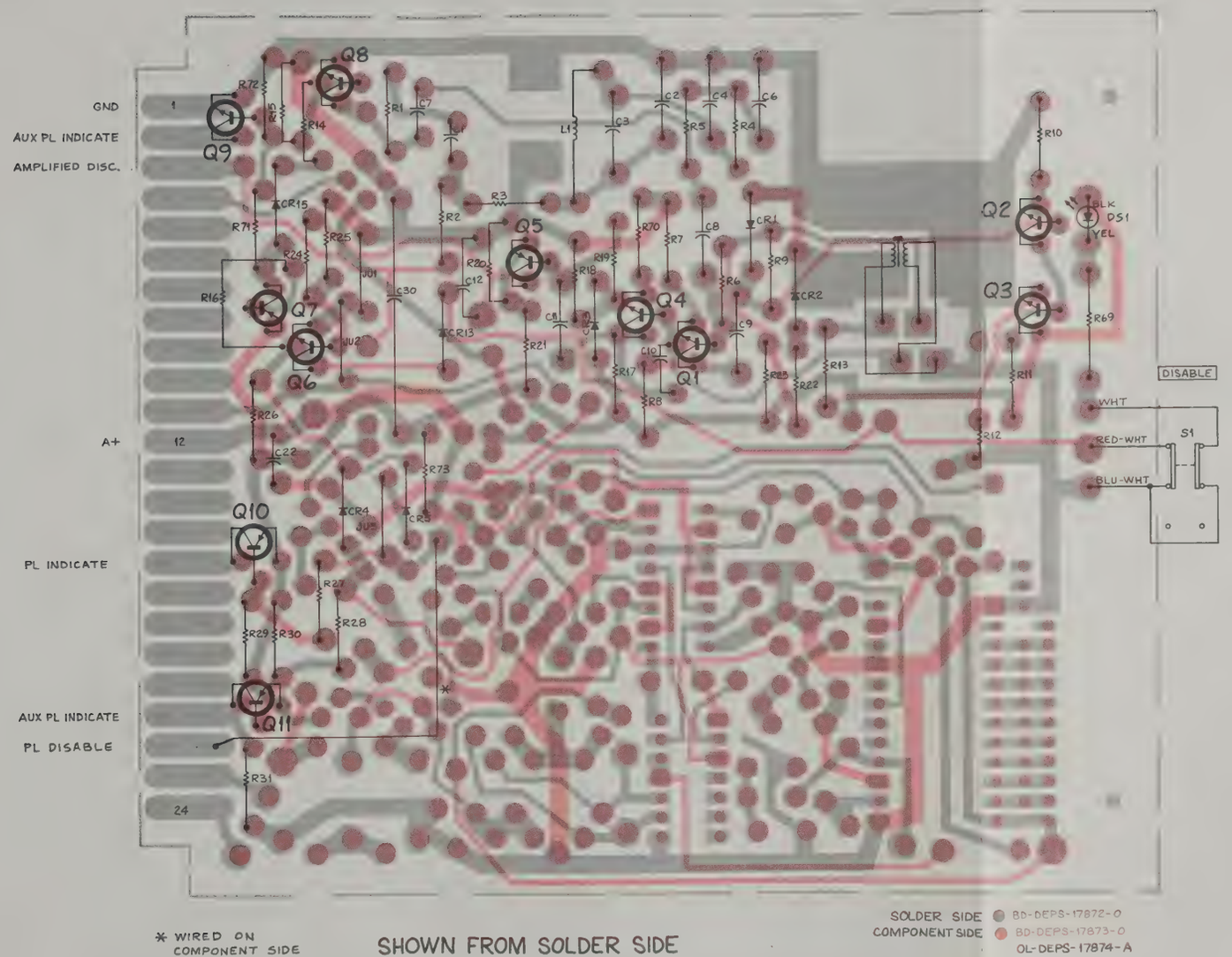
FUNCTION

Used as a digital "PL" decoder in "Spectra TAC" voting and satallite receivers. Decodes 23-bit binary code word in "Private-Line" digital squelch systems.

NOTES:

1. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS.
2. SEE TABLE 1 FOR JUMPER APPLICATIONS.
3. TRANSISTORS IN CURRENT SOURCE CIRCUIT ARE PART OF U803, SEE DETAIL A.
4. WAVEFORMS WERE TAKEN WITH AN ON-CHANNEL RF INPUT SIGNAL OF 1000 uV MODULATED WITH 1000 Hz AT 4250 Hz DEVIATION AND A DIGITALLY CODED SQUELCH SIGNAL AT 750 Hz DEVIATION FOR A TOTAL OF +5 kHz DEVIATION.
5. DC VOLTAGES MEASURED WITH A MOTOROLA DC MULTIMETER (11 MEGOHM INPUT IMPEDANCE), OR EQUIVALENT. FSQ = RECEIVER FULLY SQUELCHED, USQ = RECEIVER UNSQUELCHED.
6. VOLTAGE SHOWN IN ( ) ARE TAKEN WHEN CODE IS DETECTED.





PARTS LIST

TRN6083A "Private-Line" Tone Decoder PL-3479-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±5%; 50 V; unless otherwise stated
C1	21-847085	270 pF ±10%; 300 V
C2	8-82905G32	0.22
C3	8-82905G08	.033
C4	8-82905G07	0.1
C6, 8, 9, 11	8-82905G04	.068
C7, 10, 22	21-82428B12	.01 +80-20%; 200 V
C12	8-82905G05	0.15
C30	23-82077C01	100 +150-10%; 35 V
		DIODE: SEE NOTE
CR1 thru 5, 13, 15	48-83654H01	silicon
		LIGHT EMITTING DIODE:
DS1	48-88245C08	coded RED
		COIL, RF:
L1	24-84003A01	choke; 6H
		TRANSISTOR: SEE NOTE
Q1, 2, 3, 4, 6, 8, 9	48-869642	NPN; type M9642
Q5, 7, 10, 11	48-869643	PNP; type M9643
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R1	6-124A63	3.9k
R2, 18, 20, 23	6-124A57	2.2k
R3	6-124A69	6.8k
R4, 5, 12, 14, 26, 31	6-124A73	10k
R6, 9, 25	6-124A89	47k
R7, 10	6-124A41	470
R8, 11, 29, 30	6-124A81	22k
R13	6-124A71	8.2k
R15, 72	6-124A85	33k
R16	6-124A83	27k
R17	6-124A49	1k
R19, 24, 27, 28	6-124A97	100k
R21	6-124A33	220
R22, 70	6-124A13	33
R69	6-125A47	820; 1/2 W
R71	6-124A61	3.3k
R73	6-124A05	15
		SWITCH:
S1	40-83204B01	dpdt slide
NON-REFERENCED ITEMS		
	42-84116B01	CLAMP and SOCKET
	43-865080	BUSHING; 2 req'd.
	9-83011H01	RECEPTACLE, board mounting; 24 req'd.
	64-83657K02	PANEL

NOTE:

For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REVISIONS

68P81026E26-B

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6083A	C5	DELETED, WAS 21-82187B26 .003 uF ±10%, 100 V	HIGH-PASS FILTER
		ADDED, PL DISABLE FUNCTION	PIN 22
	R1	FROM 6-124A73; 10k TO 6-124A63; 3.9k	HIGH-PASS FILTER
	R13	FROM 6-124A67, 5.6k TO 6-124A71, 8.2k	REED DRIVER

"DIGITAL PRIVATE-LINE" DECODER

MODEL TRN6082A

FUNCTION

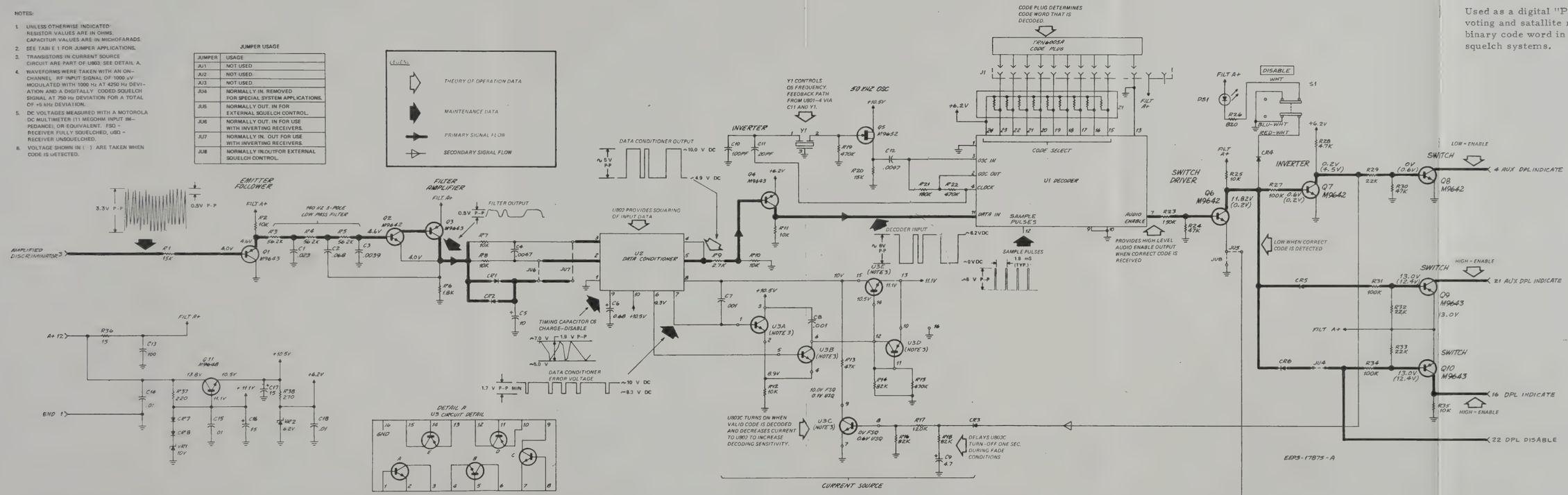
Used as a digital "PL" decoder in "Spectra TAC" voting and satallite receivers. Decodes 23-bit binary code word in "Private-Line" digital squelch systems.

NOTES:

1. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS.
2. SEE TABLE 1 FOR JUMPER APPLICATIONS.
3. TRANSISTORS IN CURRENT SOURCE CIRCUIT ARE PART OF U803. SEE DETAIL A.
4. WAVEFORMS WERE TAKEN WITH AN ON-CHANNEL RF INPUT SIGNAL OF 1000 uV MODULATED WITH 1000 Hz AT 4250 Hz DEVIATION AND A DIGITALLY CODED SQUELCH SIGNAL AT 750 Hz DEVIATION FOR A TOTAL OF +5 kHz DEVIATION.
5. DC VOLTAGES MEASURED WITH A MOTOROLA DC MULTIMETER (11 MEGOHM INPUT IMPEDANCE) OR EQUIVALENT. FSQ = RECEIVER FULLY SQUELCHED, USQ = RECEIVER UNSQUELCHED.
6. VOLTAGE SHOWN IN ( ) ARE TAKEN WHEN CODE IS UETECTED.

JUMPER USAGE

JUMPER	USAGE
JU1	NOT USED
JU2	NOT USED.
JU3	NOT USED.
JU4	NORMALLY IN. REMOVED FOR SPECIAL SYSTEM APPLICATIONS.
JU5	NORMALLY OUT. IN FOR EXTERNAL SQUELCH CONTROL.
JU6	NORMALLY OUT. IN FOR USE WITH INVERTING RECEIVERS.
JU7	NORMALLY IN. OUT FOR USE WITH INVERTING RECEIVERS.
JU8	NORMALLY IN.OUTFOR EXTERNAL SQUELCH CONTROL.



REVISIONS 68P81026E27-A

CHANGE	LOCATION
ADDED, DPL DISABLE FUNCTION	PIN 22

"SPECTRA TAC" ENCODER MODULE

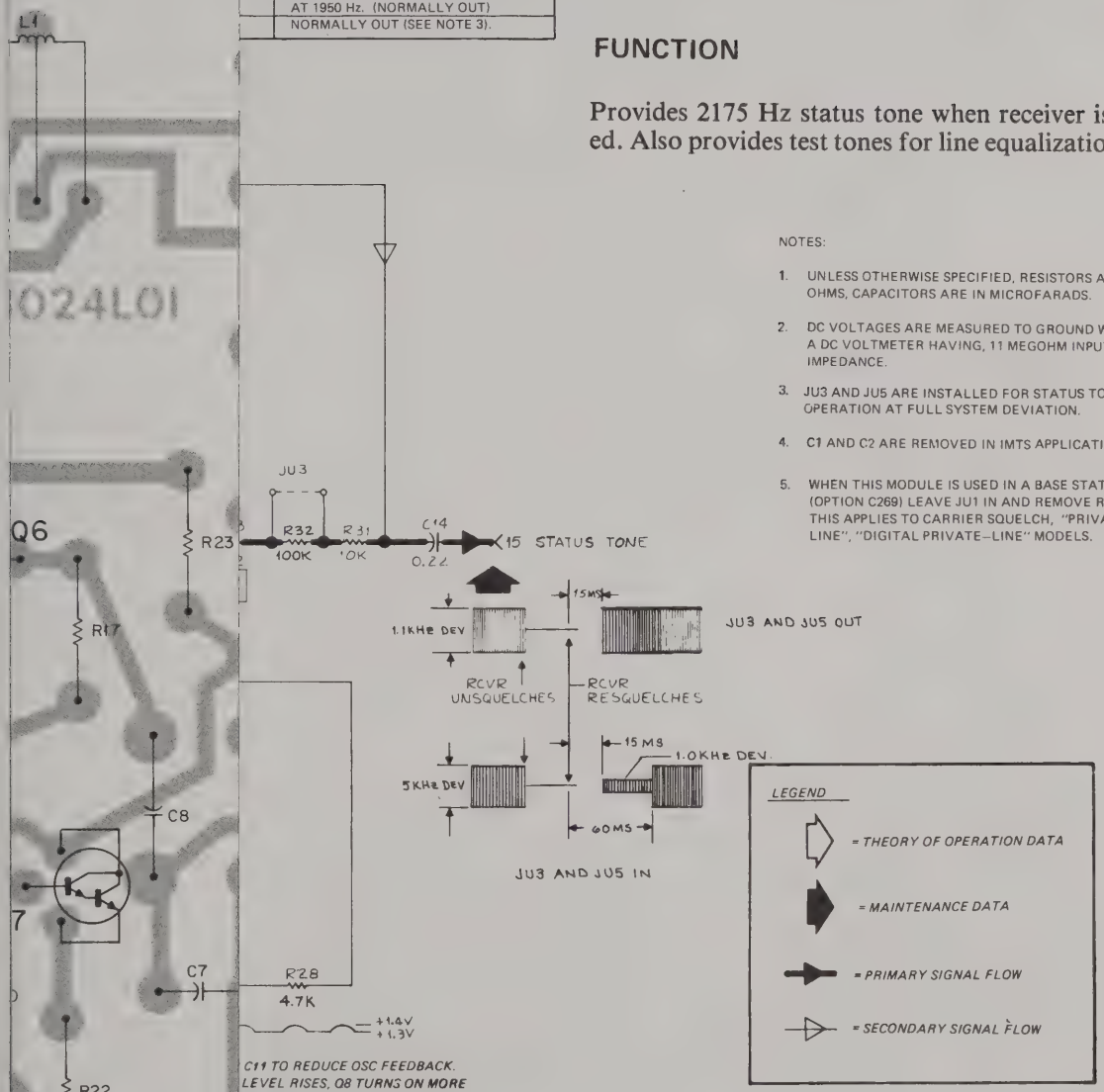
MODEL TRN6085B-1

ER USAGE TABLE

ER	USAGE
	IN FOR CARRIER SQUELCH, OUT FOR PL SQUELCH (NORMALLY IN)
	OUT FOR STATUS TONE OPERATION AT 2375 Hz. IN IMTS SYSTEMS, (NORMALLY IN)
	NORMALLY OUT (SEE NOTE 3).
	IN FOR STATUS TONE OPERATION AT 1950 Hz. (NORMALLY OUT)
	NORMALLY OUT (SEE NOTE 3).

FUNCTION

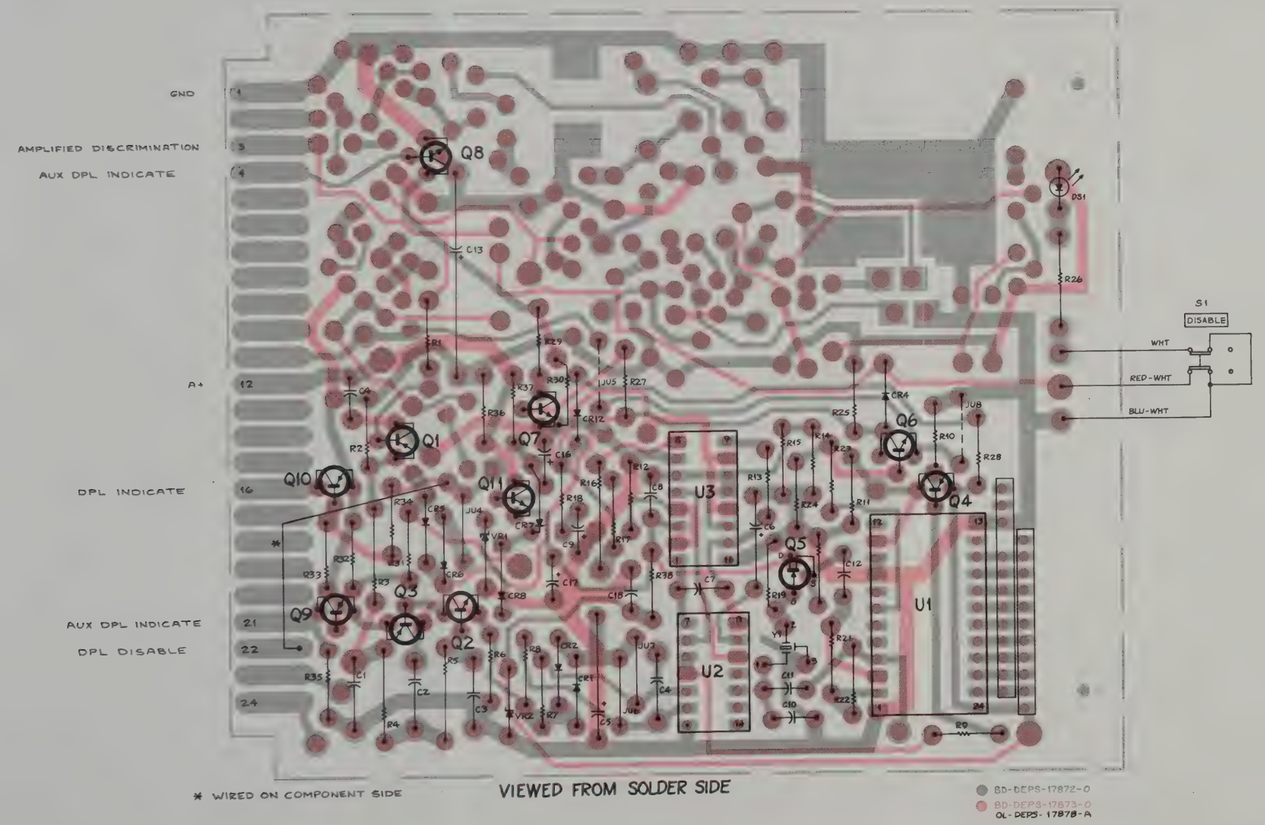
Provides 2175 Hz status tone when receiver is squelched. Also provides test tones for line equalization.



NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS, CAPACITORS ARE IN MICROFARADS.
2. DC VOLTAGES ARE MEASURED TO GROUND WITH A DC VOLTMETER HAVING, 11 MEGOHM INPUT IMPEDANCE.
3. JU3 AND JU5 ARE INSTALLED FOR STATUS TONE OPERATION AT FULL SYSTEM DEVIATION.
4. C1 AND C2 ARE REMOVED IN IMTS APPLICATIONS.
5. WHEN THIS MODULE IS USED IN A BASE STATION, (OPTION C269) LEAVE JU1 IN AND REMOVE R33. THIS APPLIES TO CARRIER SQUELCH, "PRIVATE-LINE", "DIGITAL PRIVATE-LINE" MODELS.

68P81036E36-E
7/15/81- UP



68P81026E27-B
(Sheet 2 of 2)
7/15/81- UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6082A Digital "Private-Line" Decoder PL-3477-O

		CAPACITOR, fixed: uF ±5%; 50 V; unless otherwise stated
C1	8-82905G39	.023
C2	8-83813H23	.068
C3	8-83813H19	.0039
C4	8-82905G26	.0047; 100 V
C5	23-83214C20	10 ±20%; 20 V
C6	23-82783B48	0.68; 35 V
C7, 8	21-82187B29	.001 ±10%; 100 V
C9	23-84538G02	4.7 ±20%; 20 V
C10	21-83798B01	100 pF; 200 V
C11	21-82610C22	20 pF; 200 V
C12	21-82428B09	.0047 ±10%; 100 V
C13	23-82077C01	100 +150-10%; 35 V
C14, 15, 18	21-82428B12	.01 +70-30%; 100 V
C16, 17	23-84538G04	15 ±20%; 20 V
		DIODE: SEE NOTE I
CR1, 2	48-84616A01	hot carrier
CR3 thru 8	48-83654H01	silicon
		LIGHT EMITTING DIODE:
DS1	48-88245C08	coded RED
		SOCKET:
J1	9-82071K01	female; 12 contact
		TRANSISTOR: SEE NOTE I
Q1, 3, 4, 9, 10	48-869643	PNP; type M9643
Q2, 6, 7, 8	48-869642	NPN; type M9642
Q5	48-869652	field-effect
Q11	48-869648	NPN; type M9648
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R1, 20	6-124A77	15k
R2, 7, 8, 10, 11, 12, 25, 35	6-124A73	10k
R3, 4, 5	6-13755D64	56.2k ±1%
R6	6-124A55	1.8k
R9	6-124A59	2.7k
R13, 24, 30	6-124A89	47k
R14, 16, 18	6-124A95	82k
R15, 19, 22	6-124B14	470k
R17	6-124A99	120k
R21	6-124B04	180k
R23	6-124B02	150k
R26	6-124A47	820
R27, 31, 34	6-124A97	100k
R28	6-124A65	4.7k
R29, 32, 33	6-124A81	22k
R36	6-124A05	15
R37	6-124A33	220
R38	6-124A35	270
		SWITCH:
S1	40-83204B01	dpdt slide
		INTEGRATED CIRCUIT: SEE NOTE I
U1	51-84267A82	type M6782
U2	51-84320A55	type LM565CM
U3	51-84320A79	type CA3096AE
		VOLTAGE REGULATOR: SEE NOTE I
VR1	48-82256C11	Zener type 10 V
VR2	48-83696E07	Zener type 6.2 V
		NETWORK:
Z1	51-82142K02	resistive
		CRYSTAL: SEE NOTE II
Y1	48-82003K01	resonator 50.00000-50.00000 KH

NON-REFERENCED ITEMS

	43-865080	BUSHING; 2 req'd.
	64-83657K02	PANEL
	9-83011H01	RECEPTACLE, board mounting; 24 req'd.

NOTE:

I. Replacement transistors must be ordered by Motorola part number only for optimum performance.

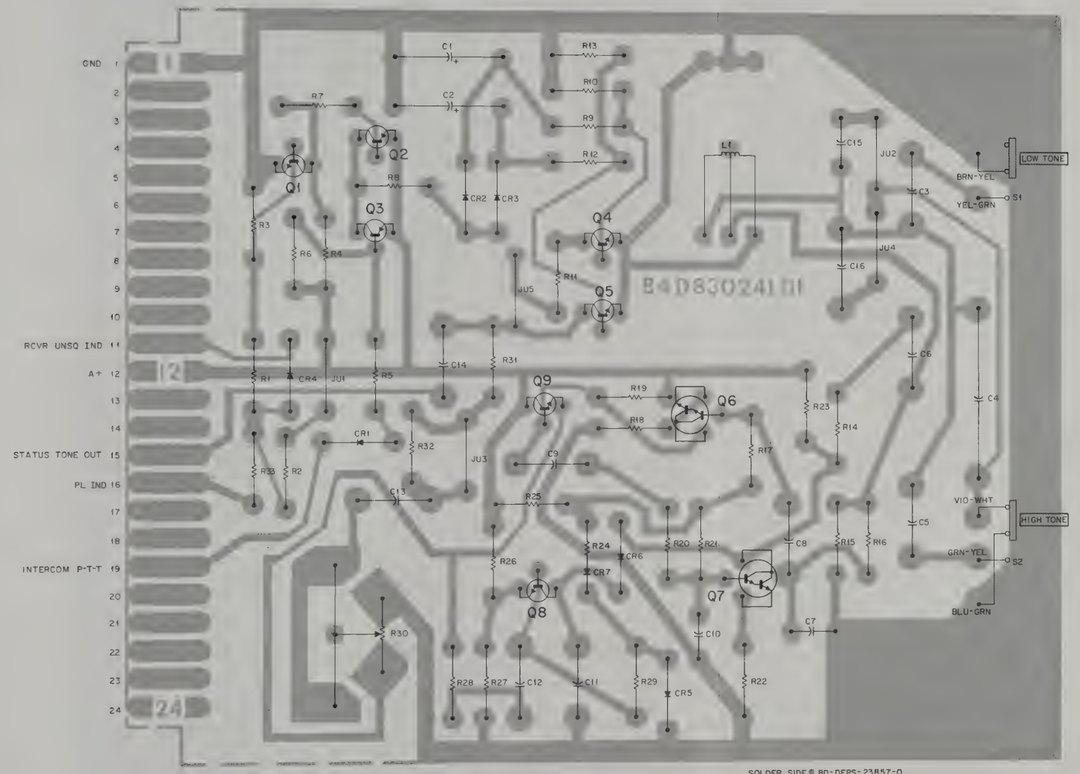
II. When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

REVISIONS 68P81026E27-A

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6082A		ADDED, DPL DISABLE FUNCTION	PIN 22

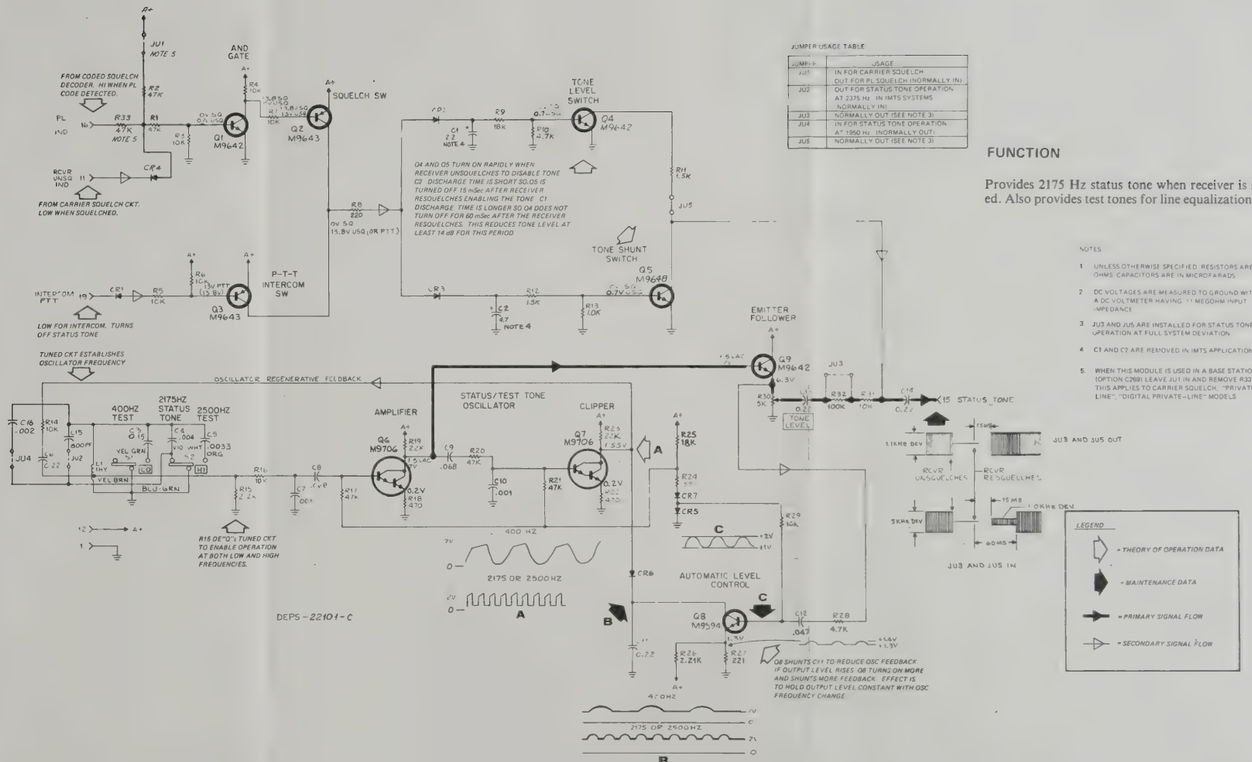
"SPECTRA TAC" ENCODER MODULE

MODEL TRN6085B-1



SOLDER SIDE ® BD-DEPS-23857-O
OL-DEPS-23859-A

SHOWN FROM SOLDER SIDE



JUMPER USAGE TABLE

JUMPER	USAGE
JU1	IN FOR CARRIER SQUELCH OUT FOR PL SQUELCH (NORMALLY IN)
JU2	OUT FOR STATUS TONE OPERATION AT 2175 Hz (N IMTS SYSTEMS NORMALLY IN)
JU3	NORMALLY OUT (SEE NOTE 3)
JU4	IN FOR STATUS TONE OPERATION AT 1950 Hz (NORMALLY OUT)
JU5	NORMALLY OUT (SEE NOTE 3)

FUNCTION

Provides 2175 Hz status tone when receiver is squelched. Also provides test tones for line equalization.

NOTES

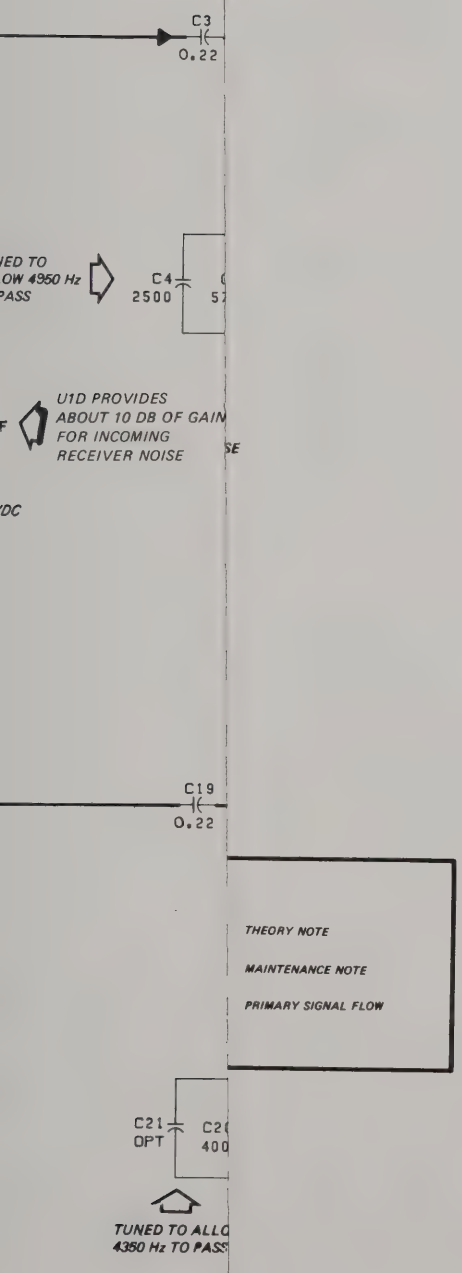
1. UNLESS OTHERWISE SPECIFIED: RESISTORS ARE IN OHMS; CAPACITORS ARE IN MICROFARADS.
2. DC VOLTAGES ARE MEASURED TO GROUND WITH A DC VOLTMETER HAVING 11 MEGOHM INPUT IMPEDANCE.
3. JU3 AND JU5 ARE INSTALLED FOR STATUS TONE OPERATION AT FULL SYSTEM DEVIATION.
4. C1 AND C2 ARE REMOVED IN IMTS APPLICATIONS.
5. WHEN THIS MODULE IS USED IN A BASE STATION (OPTION C298) LEAVE JU1 IN AND REMOVE R33. THIS APPLIES TO CARRIER SQUELCH, "PRIVATE-LINE", "DIGITAL PRIVATE-LINE" MODELS.

68P81036E36-E
7/15/81- UP

SPECTRA TAC ENCODER MODULE

RECEIVER QUALITY SIGNAL (RQS) DETECTOR

MODEL TLN5944A



FUNCTION

Samples audio noise using two sampling channels. One channel is tuned to 4200 Hz and the other is tuned to 4800 Hz. Each channel is separately amplified then summed in the output, this produces a dc output that is inversely proportional to the input.

PARTS LIST

TRN6085B Encoder Board Kit PL-5531-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 50 V; unless otherwise stated
C1	23-82783B16	2.2; 15 V
C2	23-82783B25	4.7; 25 V
C3	8-82905G05	0.15
C4	8-84326A31	.004 ±1%
C5	8-82905G25	.0033; 100 V
C6, 11, 13, 14	8-82905G11	0.22
C7, 10	21-82187B29	.001; 100 V
C8, 9	8-82905G04	.068
C12	8-82905G03	.047
C15	21-840049	800 pF; 5%; 300 V
C16	21-863293	2000 pF; 2%; 500 V
		DIODE: (SEE NOTE)
CR1 thru 5, 7	48-83654H01	silicon
CR6	48-855216	germanium
		COIL, RF:
L1	24-84200A01	1 hy
		TRANSISTOR: (SEE NOTE)
Q1, 4, 9	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q5	48-869648	NPN; type M9648
Q6, 7	49-869706	NPN; Darlington Pair; M9706
Q8	48-869594	NPN; type M9594
		RESISTOR, fixed: ± 5%; 1/4 W; unless otherwise stated
R1, 2, 17, 20 21, 33	6-11009C89	47k
R3 thru 7, 14, 16 29, 31	6-11009C73	10k
R8	6-11009C33	220
R9	6-11009C79	18k,
R10	6-11009C65	4.7k,
R11, 12	6-11009C53	1.5k,
R13	6-11009C49	1k,
R15	6-11009C57	2.2k
R18, 22	6-11009C41	470
R19, 23	6-11009C81	22k
R24	6-11009C53	33,
R25	6-11009C79	18k;
R26	6-84444A08	2.21k ±1%
R27	6-84444A07	221 ±1%
R28	6-11009C65	4.7k
R30	18-83168C07	var; 5k
R32	6-11009C97	100k
		SWITCH; slide:
S1, 2	40-83468E01	spdt; momentary
	NON-REFERENCED ITEMS	
	64-83118L01	PANEL
	43-865080	BUSHING; 2 req'd.
	9-83011H01	RECEPTACLE, female; 10 req'd
	3-134212	SCREW, Tapping; 4-40 x 5/16"; 2 used
	42-84315A01	CLIP, ground

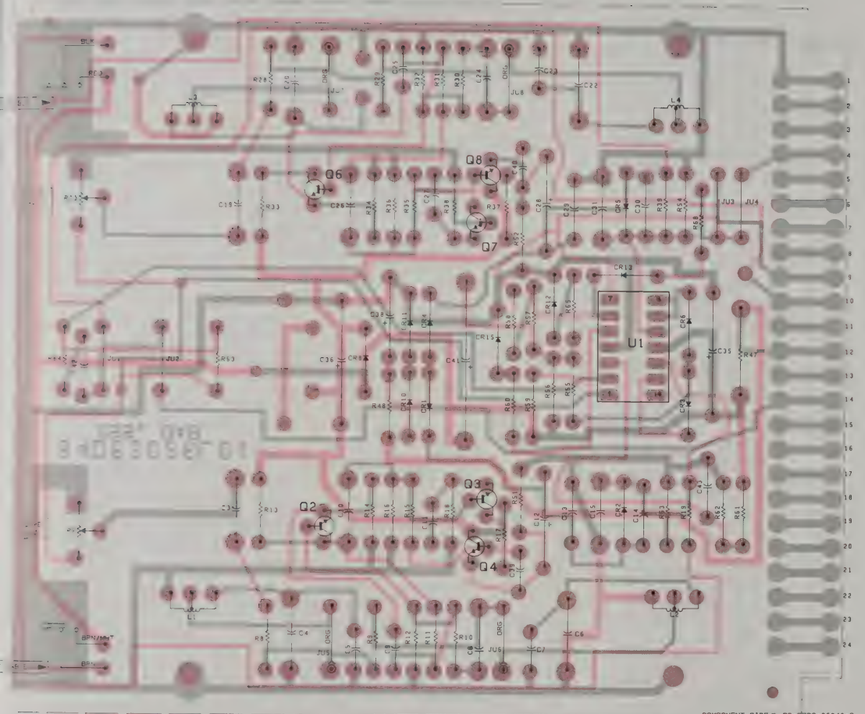
NOTE:

For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REVISIONS

68P81036E36-B

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6085B-1	C12	FROM 8-82905G08, .033 UF TO 8-82905G03, .047 UF	Q8 BASE CIRCUIT
	CR7	ADDED 48-83654H01	
	Q6, 7	FROM 48-869642, M9642 TO 48-869706, M9706	AMPL., CLIPPER
	R25	FROM 6-124A57, 2.2k TO 6-124A79, 18k	Q8 BASE CIRCUIT
	R26	FROM 6-124C57, 2.2k ±10% TO 6-84444A08, 2.21k ±1%	Q8 EMITTER
	R27	FROM 6-124C33, 220 ±10% TO 6-84444A07, 221 ±1%	
	R28	FROM 6-124C61, 3.3k TO 6-124C65, 4.7	Q8 BASE CIRCUIT



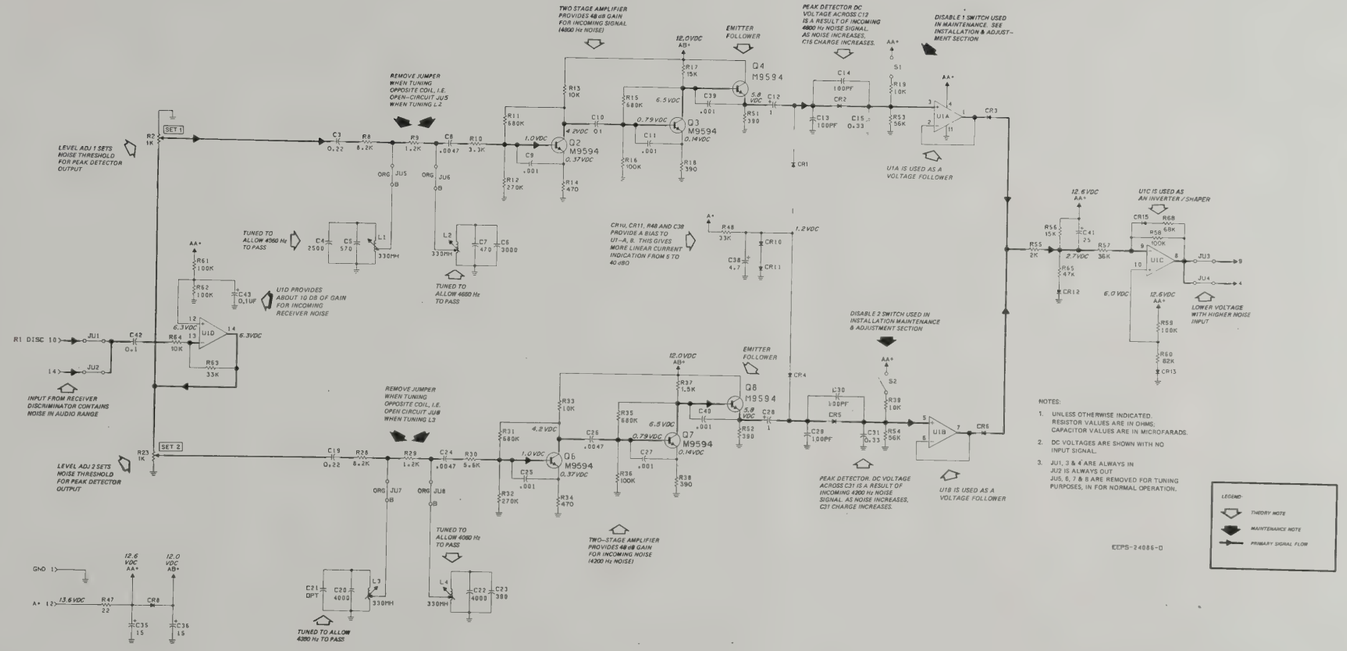
SHOWN FROM COMPONENT SIDE

RECEIVER QUALITY SIGNAL (RQS) DETECTOR

MODEL TLN5944A

FUNCTION

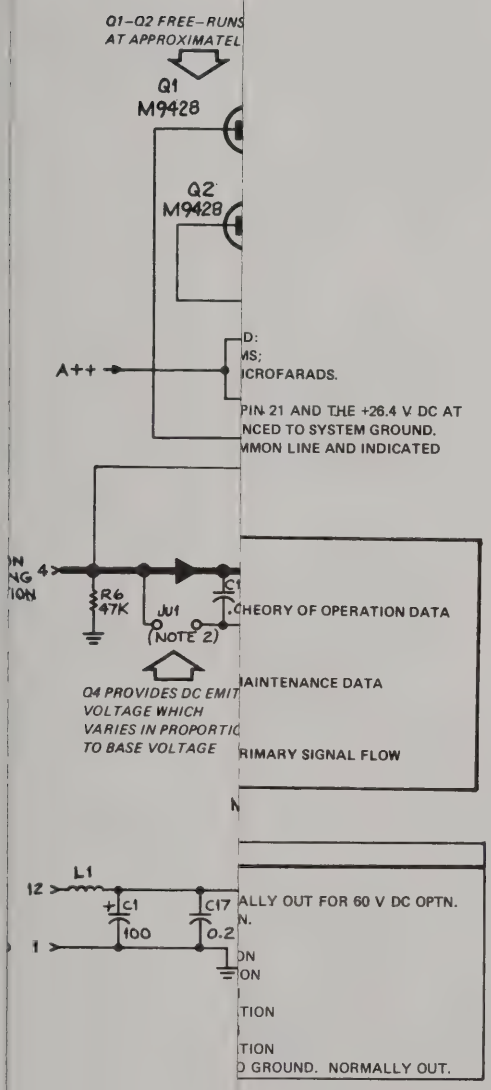
Samples audio noise using two sampling channels. One channel is tuned to 4200 Hz and the other is tuned to 4800 Hz. Each channel is separately amplified then summed in the output, this produces a dc output that is inversely proportional to the input.


LEVEL ADJ 1 SETS NOISE THRESHOLD FOR PEAK DETECTOR OUTPUT
REMOVE JUMPER WHEN TUNING OPPOSITE COIL, I.E. OPEN-CIRCUIT JU5 WHEN TUNING L2
TWO STAGE AMPLIFIER PROVIDES 48 dB GAIN FOR INCOMING SIGNAL (4800 Hz NOISE)
EMITTER FOLLOWER
PEAK DETECTOR DC VOLTAGE ACROSS C13 IS A RESULT OF INCOMING 4800 Hz NOISE SIGNAL. AS NOISE INCREASES, C13 CHARGE INCREASES.
DISABLE 1 SWITCH USED IN MAINTENANCE. SEE INSTALLATION & ADJUSTMENT SECTION
TUNED TO ALLOW 4560 Hz TO PASS
TUNED TO ALLOW 4800 Hz TO PASS
U1A IS USED AS A VOLTAGE FOLLOWER
U1C IS USED AS AN INVERTER / SHAPER
U1D PROVIDES ABOUT 10 DB OF GAIN FOR INCOMING RECEIVER NOISE
CR10, CR11, R48 AND C38 PROVIDE A BIAS TO U1-A, B. THIS GIVES MORE LINEAR CURRENT INDICATION FROM 5 TO 40 dBO
LOWER VOLTAGE WITH HIGHER NOISE INPUT
INPUT FROM RECEIVER DISCRIMINATOR CONTAINS NOISE IN AUDIO RANGE
LEVEL ADJ 2 SETS NOISE THRESHOLD FOR PEAK DETECTOR OUTPUT
REMOVE JUMPER WHEN TUNING OPPOSITE COIL, I.E. OPEN CIRCUIT JU8 WHEN TUNING L3
TWO-STAGE AMPLIFIER PROVIDES 48 dB GAIN FOR INCOMING NOISE (4200 Hz NOISE)
TUNED TO ALLOW 4080 Hz TO PASS
TUNED TO ALLOW 4280 Hz TO PASS
DISABLE 2 SWITCH USED IN INSTALLATION MAINTENANCE & ADJUSTMENT SECTION
PEAK DETECTOR DC VOLTAGE ACROSS C31 IS A RESULT OF INCOMING 4200 Hz NOISE SIGNAL. AS NOISE INCREASES, C31 CHARGE INCREASES.
U1B IS USED AS A VOLTAGE FOLLOWER
NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
2. DC VOLTAGES ARE SHOWN WITH NO INPUT SIGNAL.
3. JU1, 3 & 4 ARE ALWAYS IN JU2 IS ALWAYS OUT JU5, 6, 7 & 8 ARE REMOVED FOR TUNING PURPOSES, IN FOR NORMAL OPERATION.
LEGEND:
THEORY NOTE
MAINTENANCE NOTE
PRIMARY SIGNAL FLOW
ECPS-24086-D

68P81041E18-B
(Sheet 1 of 2)
7-15-81 UP

RECEIVER QUALITY SIGNAL (RQS) LINE CURRENT GENERATOR

MODEL TLN5946A



FUNCTION

Provides a direct current over the receive phone lines. This current is proportional to the dc voltage received from RQS detector.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6085B Encoder Board Kit PL-5531-C

		CAPACITOR, fixed: uF ±10%; 50 V; unless otherwise stated
C1	23-82783B16	2.2; 15 V
C2	23-82783B25	4.7; 25 V
C3	8-82905G05	0.15
C4	8-84326A31	.004 ±1%
C5	8-82905G25	.0033; 100 V
C6, 11, 13, 14	8-82905G11	0.22
C7, 10	21-82187B29	.001; 100 V
C8, 9	8-82905G04	.068
C12	8-82905G03	.047
C15	21-840049	800 pF; 5%; 300 V
C16	21-863293	2000 pF; 2%; 500 V
		DIODE: (SEE NOTE)
CR1 thru 5, 7	48-83654H01	silicon
CR6	48-855216	germanium
		COIL, RF:
L1	24-84200A01	1 hy
		TRANSISTOR: (SEE NOTE)
Q1, 4, 9	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q5	48-869648	NPN; type M9648
Q6, 7	49-869706	NPN; Darlington Pair; M9706
Q8	48-869594	NPN; type M9594
		RESISTOR, fixed: ± 5%; 1/4 W; unless otherwise stated
R1, 2, 17, 20 21, 33	6-11009C89	47k
R3 thru 7, 14, 16 29, 31	6-11009C73	10k
R8	6-11009C33	220
R9	6-11009C79	18k,
R10	6-11009C65	4.7k,
R11, 12	6-11009C53	1.5k,
R13	6-11009C49	1k,
R15	6-11009C57	2.2k
R18, 22	6-11009C41	470
R19, 23	6-11009C81	22k
R24	6-11009C53	33,
R25	6-11009C79	18k;
R26	6-84444A08	2.21k ±1%
R27	6-84444A07	221 ±1%
R28	6-11009C65	4.7k
R30	18-83168C07	var; 5k
R32	6-11009C97	100k
		SWITCH; slide:
S1, 2	40-83468E01	spdt; momentary
	NON-REFERENCED ITEMS	
	64-83118L01	PANEL
	43-865080	BUSHING; 2 req'd.
	9-83011H01	RECEPTACLE, female; 10 req'd
	3-134212	SCREW, Tapping; 4-40 x 5/16"; 2 used
	42-84315A01	CLIP, ground

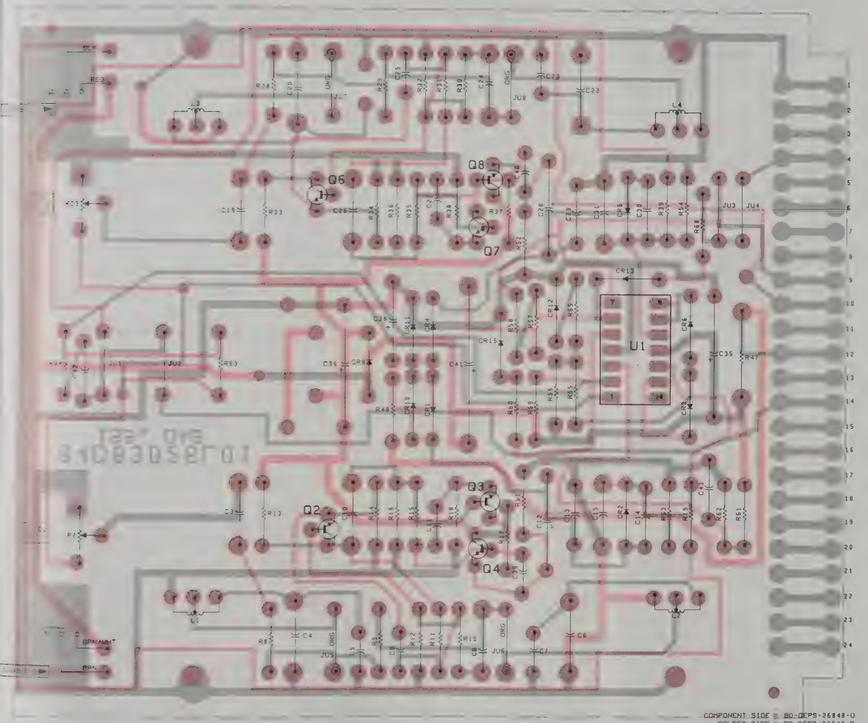
NOTE:

For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REVISIONS

68P81036E36-B

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6085B-1	C12	FROM 8-82905G08, .033 UF TO 8-82905G03, .047 UF	Q8 BASE CIRCUIT
	CR7	ADDED 48-83654H01	
	Q6, 7	FROM 48-869642, M9642 TO 48-869706, M9706	AMPL., CLIPPER
	R25	FROM 6-124A57, 2.2k TO 6-124A79, 18k	Q8 BASE CIRCUIT
	R26	FROM 6-124C57, 2.2k ±10% TO 6-84444A08, 2.21k ±1%	Q8 EMITTER
	R27	FROM 6-124C33, 220 ±10% TO 6-84444A07, 221 ±1%	
	R28	FROM 6-124C61, 3.3k TO 6-124C65, 4.7	Q8 BASE CIRCUIT



SHOWN FROM COMPONENT SIDE

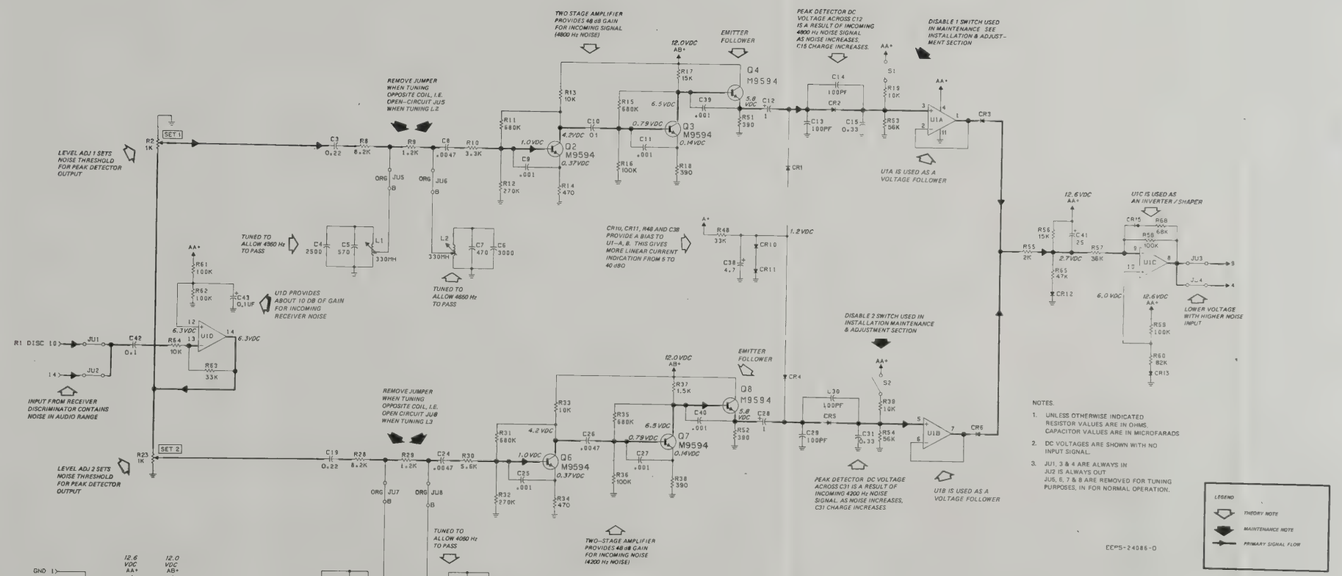
COMPONENT SIDE = 80-DEPS-26848-D
SOLDER SIDE = 80-DEPS-26849-D
OL-DEPS-26850-A

RECEIVER QUALITY SIGNAL (RQS) DETECTOR

MODEL TLN5944A

FUNCTION

Samples audio noise using two sampling channels. One channel is tuned to 4200 Hz and the other is tuned to 4800 Hz. Each channel is separately amplified then summed in the output, this produces a dc output that is inversely proportional to the input.


TWO STAGE AMPLIFIER PROVIDES 46 dB GAIN FOR INCOMING SIGNAL (4800 Hz NOISE)
REMOVE JUMPER WHEN TUNING OPPOSITE COIL, I.E. OPEN CIRCUIT JU5 WHEN TUNING L2
LEVEL ADJ 1 SETS NOISE THRESHOLD FOR PEAK DETECTOR OUTPUT
TUNED TO ALLOW 4800 Hz TO PASS
U1D PROVIDES ABOUT 10 DB OF GAIN FOR INCOMING RECEIVER NOISE
CR10, CR11, R48 AND C38 PROVIDE A BIAS TO U1-A, B. THIS GIVES MORE LINEAR CURRENT INDICATION FROM 5 TO 40 dBO
PEAK DETECTOR DC VOLTAGE ACROSS C12 IS A RESULT OF INCOMING 4800 Hz NOISE SIGNAL AS NOISE INCREASES, C12 CHARGE INCREASES.
DISABLE 1 SWITCH USED IN MAINTENANCE SEE INSTALLATION & ADJUSTMENT SECTION
U1A IS USED AS A VOLTAGE FOLLOWER
U1C IS USED AS AN INVERTER / SHAPER
LOWER VOLTAGE WITH HIGHER NOISE INPUT
R1 DISC 10
INPUT FROM RECEIVER DISCRIMINATOR CONTAINS NOISE IN AUDIO RANGE
LEVEL ADJ 2 SETS NOISE THRESHOLD FOR PEAK DETECTOR OUTPUT
REMOVE JUMPER WHEN TUNING OPPOSITE COIL, I.E. OPEN CIRCUIT JU8 WHEN TUNING L3
TUNED TO ALLOW 4060 Hz TO PASS
TUNED TO ALLOW 4350 Hz TO PASS
TWO-STAGE AMPLIFIER PROVIDES 48 dB GAIN FOR INCOMING NOISE (4200 Hz NOISE)
DISABLE 2 SWITCH USED IN INSTALLATION MAINTENANCE & ADJUSTMENT SECTION
PEAK DETECTOR DC VOLTAGE across C31 IS A RESULT OF INCOMING 4200 Hz NOISE SIGNAL AS NOISE INCREASES, C31 CHARGE INCREASES.
U1B IS USED AS A VOLTAGE FOLLOWER
NOTES:
1. UNLESS OTHERWISE INDICATED RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS.
2. DC VOLTAGES ARE SHOWN WITH NO INPUT SIGNAL.
3. JU1, 3 & 4 ARE ALWAYS IN JU2 IS ALWAYS OUT JU5, 6, 7 & 8 ARE REMOVED FOR TUNING PURPOSES, IN FOR NORMAL OPERATION.
LEGEND
THEORY NOTE
MAINTENANCE NOTE
PRIMARY SIGNAL FLOW
ECPS-24086-D

VOTING ENCODER MODULE

MODEL TLN1460A

FOR USE WITH Z00NNB SERIES COMPARATORS

1. DESCRIPTION

(Refer to Figure 1.)

The TLN1460A Voting Encoder Module is a solid-state plug-in unit utilizing three integrated circuits. The module is designed to be used in Motorola's total area coverage (TAC) receiver-encoder used with Z00NNB Series Comparators. All circuit components are mounted on a single circuit board and the front panel. The front panel provides mounting facilities for two switches, and two status indicators. Access to two circuit adjustments is also gained through the front panel.

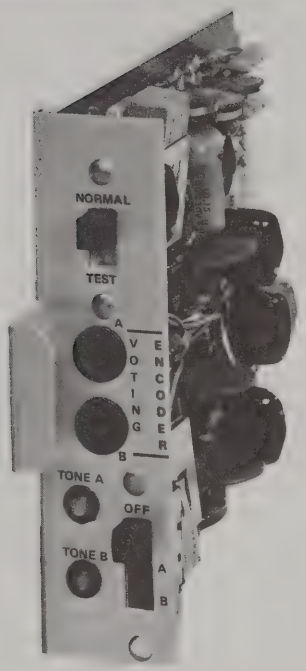


Figure 1. Voting Encoder Module

2. FUNCTION

The voting encoder module is used to monitor the quieting level of the station's receiver discriminator output and the "PL" decoder's output ("Private-Line" systems only), and generates a tone code corresponding to the quieting level. In systems utilizing "Private-Line" coded squelch the voting module is enabled by the "PL" decoder when the correct coded signal is received. At other times, the voting module remains disabled. In systems not utilizing the "Private-Line" feature, the voting module is constantly enabled.

The voting encoder module tone code output is sent with receiver audio on a wire line or other carrier system, to an associated comparator for use in selecting the receiver with the best quieting level. When the received message is strong enough to produce a receiver quieting level between 10dBq and 19dBq, tone A is sent to the comparator. When receiver quieting level is between 20dBq and 29dBq, tones A and B are sent to the comparator. When receiver quieting is 30dBq or greater, only tone B is sent to the comparator.

3. CIRCUIT DESCRIPTION

3.1 NOISE AMPLIFIER

Receiver discriminator emitter follower output is routed from the audio board to the input of a two-stage noise amplifier, Q1 and Q2. This amplifier which provides 8dB of gain, also functions as a limiter and isolating circuit. Potentiometers R13, R14, and R11 in the emitter and collector circuits of Q2 allow setting the desired reference levels for 10dB, 20dB, and 30dB of quieting, respectively. Since the noise voltage level is very low for a signal that produces 30dB of quieting, variable resistor R11 is located in the collector circuit of Q2 where more gain is available.

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60172

68P81026E29-B
6/12/81-UP

parts list

TLN5944A Receiver Quality Signal Detector — PL-6358-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ±5%; 500 V: unless otherwise stated
C3	8-82905G11	0.22 ±10%; 50 V
C4	21-863296	2500 pF ±2%; 50 V
C5	21-82633E17	570 pF; 100 V
C6	21-850994	3000 pF
C7	21-82537B06	470 pF; 300 V
C8	8-82905G26	.0047 ±10%; 100 V
C9	21-82187B29	.001 ±10%; 100 V
C10	8-82905G07	0.1 ±10%; 50 V
C11	21-82187B29	.001 ±10%; 100 V
C12	23-82783B08	1.0 ±20%; 35 V
C13, 14	21-83798B17	100 pF; 200 V
C15	8-82905G42	0.33 ±10%; 50 V
C19	8-82905G11	0.22 ±10%; 50 V
C20	21-863396	4000 pF ±1%
C21	21-859945	390 pF
C22	21-863396	4000 pF ±1%
C24	8-82905G26	.0047 ±10%; 100 V
C25	21-82187B29	.001 ±1%; 100 V
C26	8-82905G07	0.1 ±10%;50 V
C27	21-82187B29	.001 ±10%; 100 V
C28	23-82783B08	1 ±20%; 35 V
C29, 30	21-82187B29	.001 ±10%; 100 V
C31	8-82905G42	0.33 ±10%; 50 V
C35, 36	23-865136	15 ±20%; 25 V
C38	23-84762H07	4.7 ±20%; 10 V
C39, 40	21-82187B29	.001 ±10%; 100 V
C41	23-82601A26	25 +150-10%; 20 V
C42, 43	21-82372C01	0.1 uF +80-20%; 25 V
		diode: (see note)
CR1, 2	48-84616A01	hot carrier
CR3	48-83654H01	silicon
CR4, 5	48-84616A01	hot carrier
CR6 thru 12	48-83654H01	silicon
		coil: rf
L1, 2, 3, 4	**24-84200A05**	**900 turns**
		transistor: (see note)
Q2, 3, 4, 6, 7, 8	48-869594	NPN; type M9594
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R2	18-83518L01	variable; 1k
R8	6-11009C71	8.2k
R9	6-11009C51	1.2k
R10	6-11009C61	3.3k
R11	6-11009C18	680k
R12	6-11009D08	270k
R13	6-11009C73	10k
R14	6-11009C41	470
R15	6-11009D18	680k
R16	6-11009C97	100k
R17	6-11009C77	15k
R18	6-11009C39	390
R19	6-11009C73	10k
R23	18-83518L01	variable; 1k
R28	6-11009C71	8.2k
R29	6-11009C51	1.2k
R30	6-11009C67	5.6k
R31	6-11009D18	680k
R32	6-11009D08	270k
R33	6-11009C73	10k
R34	6-11009C41	470
R35	6-11009D18	680k
R36	6-11009C97	100k
R37	6-11009C77	15k
R38	6-11009C39	390
R39	6-11009C73	10k
R47	6-125A09	22; 1/2 W
R48	6-11009C85	33k
R51, 52	6-11009C39	390
R53	6-11009C91	56k
R54	6-11009C91	56k
R55	6-11009C56	2k
R56	6-11009C77	15k
R57	6-11009C86	36k
R58, 59	6-11009C97	100k
R60	6-11009C95	82k
R61, 62	6-11009C97	100k
R63	6-11009C85	33k
R64	6-11009C73	10k
R65	6-11009C89	47k
R68	6-11009C93	68k
		switch:
S1, 2	40-83468E01	slide
		integrated circuit: (see note)
U1	51-83629M08	type LM324

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		mechanical parts
	3-134212	SCREW, tapping; 4-40 x 5/16"; 2 used
	42-83035L01	STRAP, ground
	64-83163L02	PANEL
	9-83011H01	RECEPTACLE, female; 14 used
	39-10184A10	CONTACT, plug; 4 used
	43-865080	BUSHING; 2 used
	29-83167C01	TERMINAL, strain relief
	39-10184A24	CONTACT, receptacle
	14-843464	FORM, coil

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

VOTING ENCODER MODULE

MODEL TLN1460A

FOR USE WITH Z00NNB SERIES COMPARATORS

1. DESCRIPTION

(Refer to Figure 1.)

The TLN1460A Voting Encoder Module is a solid-state plug-in unit utilizing three integrated circuits. The module is designed to be used in Motorola's total area coverage (TAC) receiver-encoder used with Z00NNB Series Comparators. All circuit components are mounted on a single circuit board and the front panel. The front panel provides mounting facilities for two switches, and two status indicators. Access to two circuit adjustments is also gained through the front panel.

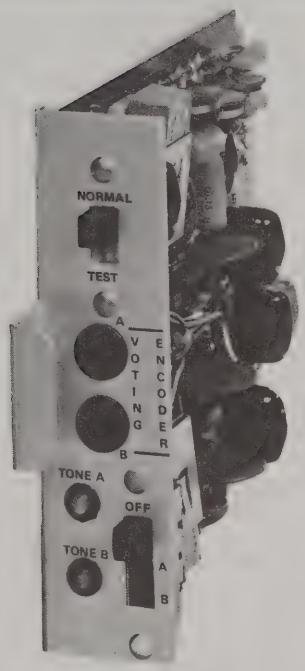


Figure 1. Voting Encoder Module

2. FUNCTION

The voting encoder module is used to monitor the quieting level of the station's receiver discriminator output and the "PL" decoder's output ("Private-Line" systems only), and generates a tone code corresponding to the quieting level. In systems utilizing "Private-Line" coded squelch the voting module is enabled by the "PL" decoder when the correct coded signal is received. At other times, the voting module remains disabled. In systems not utilizing the "Private-Line" feature, the voting module is constantly enabled.

The voting encoder module tone code output is sent with receiver audio on a wire line or other carrier system, to an associated comparator for use in selecting the receiver with the best quieting level. When the received message is strong enough to produce a receiver quieting level between 10dBq and 19dBq, tone A is sent to the comparator. When receiver quieting level is between 20dBq and 29dBq, tones A and B are sent to the comparator. When receiver quieting is 30dBq or greater, only tone B is sent to the comparator.

3. CIRCUIT DESCRIPTION

3.1 NOISE AMPLIFIER

Receiver discriminator emitter follower output is routed from the audio board to the input of a two-stage noise amplifier, Q1 and Q2. This amplifier which provides 8dB of gain, also functions as a limiter and isolating circuit. Potentiometers R13, R14, and R11 in the emitter and collector circuits of Q2 allow setting the desired reference levels for 10dB, 20dB, and 30dB of quieting, respectively. Since the noise voltage level is very low for a signal that produces 30dB of quieting, variable resistor R11 is located in the collector circuit of Q2 where more gain is available.

MOTOROLA INC.
Communications Division

service publications
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NOTE

Potentiometers R11, R13, and R14 are adjusted to the above listed quieting levels when shipped from factory. If the installation requires different quieting levels, refer to appropriate adjustment procedures in maintenance section.

3.2 INTEGRATED CIRCUITS IC1, IC2, AND IC3 OPERATION

Potentiometers R13, R14, and R11 wipers are connected to inputs at pin 14 on three identical integrated circuits, IC1, IC2, and IC3, respectively. With no overriding circuit functions present, each IC provides a high output at pins 6 and 7 when the input noise voltage present at pin 15 decreases to a predetermined value. The following description pertains to IC1 and associated components. Since IC2 and IC3 are identical to IC1, with the exception of reference designations, the description will be applicable to all three integrated circuits.

The input signal to IC1 at pin 15 is obtained from the wiper of potentiometer R13. An input network consisting of R57, C43, and C44 which precedes IC1 functions as a high-pass filter. The low frequencies are attenuated, thereby reducing the effect of voice signals in the IC circuit. This results in a more sensitive threshold squelch action. The first amplifier and limiter is driven into limiting by the input signal. An amplitude-limited noise signal is applied to a second amplifier through a coupling network of C46 and C47. This coupling network also functions as a high-pass filter which further attenuates the voice signals. The noise level is further amplified and RC-coupled to the detector input. Capacitor C48 and resistor R61 function as another high-pass filter. Capacitor C49 is used to produce peak-to-peak detector action from the noise detector and thereby generates twice the output voltage of a peak detector. This capacitor does not affect the frequency response.

Detector output level is a function of the received signal strength, or quieting level, and the setting of input level control R13. The dc detector output is developed across capacitor C50 with the lowest output corresponding to a no signal condition (maximum noise or minimum quieting). With no input signal (minimum detector output), the long "squelch-tail," and the long "squelch-tail" defeat circuits are off. The carrier squelch logic circuit output is low in this condition which in turn holds the two shunt switches off through the squelch control logic circuit. With the shunt switches off, the output at pins 6 and 7 on IC1 is a low ground).

As the input signal level increases, the quieting level also increases. This results in the detector output voltage increasing proportionally. When the detector output becomes greater than 2.8 volts dc, the long "squelch-tail" circuit turns on producing 5.5 volts dc at pin 12 of the IC. Since only 3.8 volts dc at pin 12 is required, the carrier squelch logic circuit turns on. Capacitor C51 and resistor R62 at pin 12 provides a fast-rise time and a slow-decay time constant. This permits a weak signal to immediately turn on the carrier squelch logic circuit while preventing rapidly fluctuating signal strength from switching the circuit on and off. With the carrier squelch logic circuit on and no external inhibiting signals (described in a later paragraph) present at IC pins 8, 11, and 14, the shunt switches are turned on. This results in a high being present at pins 6 and 7 of the IC1.

The long "squelch-tail" defeat circuit turns on when the input signal strength is sufficient to produce a voltage greater than 5 volts at pin 12 on IC1. When the long "squelch-tail" defeat circuit turns on, it turns off the long "squelch-tail" circuit. However, the detector output, when this occurs, is sufficient to keep the carrier squelch logic circuit on.

3.3 TONE A ENABLE

When the received signal is sufficient in strength to produce 10 to 19 dB quieting, a high is present at pins 6 and 7 of IC1. This high turns on the A driver Q8. With Q8 turned on, a ground is applied to the gate of FET tone A gate Q7 and to the cathode of LED 2. Tone A gate Q7 turns on, which routes the output tone A generator (which is always running) to the base of tone amplifier Q4. Tone A is amplified by Q4 and is routed through module connector pin 15 to a line amplifier. In the line amplifier, the tone is combined with the received audio on a line to the comparator.

The ground from A driver Q8, applied to the cathode of LED 2, causes that light-emitting diode to illuminate. When illuminated, this indicator, mounted on the module front panel, indicates that tone A is being gated out and is referred to as a level 1 condition.

When a signal of at least 10 dB of quieting is present at the input of IC1 (pin 15), pin 10 of IC1 will be low. This low is only a function of the input quieting level and is not affected by the presence of any inhibiting signals. The low at IC1-10 turns off Q9 causing its collector to go high. This high, present at module connector pin 17, enables the line amplifier causing audio to be gated out onto the line. When less than 10dB of quieting is received, IC1-10 is high causing the collector of Q9 to go low. This low disables the line amplifier.

3.4 TONE B ENABLE

When the received signal is sufficient in strength to produce 20 to 29 dB quieting, a high is present at pins 6 and 7 of IC2. This high turns on B driver Q6. With Q6 turned on, a ground is applied to the gate of FET tone B gate Q5 and to the cathode LED 1. Tone B gate Q5 turns on which routes the output of tone B generator (which is always running) to tone amplifier Q4. Since tone A is also present, tone amplifier Q4 amplifies both tones and routes them to the line amplifier.

The ground from B driver Q7 applied to the cathode of LED 1, causes that light-emitting diode to illuminate. This indicator mounted on the module front panel, when illuminated, indicates that tone B is being gated out. When both indicators A and B are illuminated, a level 2 condition is present.

3.5 TONE A DISABLE

When the received signal is sufficient in strength to produce at least 30 dB quieting, a high is present at pins 6 and 7 of IC3. This high in effect removes the ground from the emitter of Q10, causing Q10 to turn off. When this occurs, the collector of Q10 rises from ground to 9.0 vdc which is coupled to pin 11 on IC1. The high at IC1, pin 11, is an inhibiting signal that causes the IC1 shunt switches to ground pins 6 and 7. This causes A driver Q8 and tone A gate Q7 to turn off. Therefore, tone A is removed from the tone output and tone A lamp extinguishes. The line amplifier disable at module connector pin 17 however, remains high since there is more than 10 dB of quieting at IC1-15. Tone B output is still present at module connector pin 15 and the B front panel lamp remains illuminated. This condition is referred to as level 3.

3.6 "PL" INDICATE

A "PL" indicate signal (high) from the "PL" detector in the receiver is required at module connector pin 16 before voting can occur. (In carrier squelch systems where there is no "PL" indicating function, the DISABLE switch on the coded squelch is operated in the off position. This places a ground at module connector pin 20 and thereby accomplishes the same results as the presence "PL" indicate signal.) In the absence of a "PL" indicate signal (or a ground at pin 20), the collector of Q3 is high. This high is applied to pin 11 on IC2 and pin 8 on IC3. The high at IC2-11 is an inhibiting function preventing pins 6 and 7 from going high. Therefore, tone B cannot be gated out to the line amplifier. The high applied to IC3-8 causes IC3, pins 6 and 7, to go high which results in the collector of Q10 raising to 9.0 vdc. As previously described, the 9.0 vdc is applied to IC1-11 thereby preventing tone A from being gated to the line amplifier. When the "PL" indicate (or a ground at module connector pin 20) is present, the collector of Q3 is grounded This removes the high from IC2-11 and IC3-8 and therefore normal operation of the voting module can occur.

3.7 TEST CIRCUITS

There are two switches on the front panel; OFF-A-B switch S1 and NORMAL-TEST switch S2. When S2 is in the NORMAL position, the voting module is enabled and will vote on receiver quieting and proper "PL" indicate. In this configuration S1 maybe placed in either A or B position to allow the lights to indicate the tone(s) gated to the line amplifier. The lights are inoperative when S1 is in the OFF position.

When S2 is in TEST position, the base of Q2 is grounded. This isolates the receiver noise from the encoder section and makes the input to each IC appear as a fully quieted signal from the receiver discriminator. In normal operation, a fully quieted noise signal would result in tone B being gated out to the line amplifier. However, during testing with S2 in TEST and S1 in OFF, a ground is applied to the base of Q3. This duplicates the conditions of no "PL" indicate signal (or no "PL" disable control). Therefore, neither tone A or tone B is gated out to the line amplifier.

When S2 is in TEST position and S1 is in position A, a high is applied to the base of Q3. This duplicates the "PL" indicate signal and thereby enables the voting process. However, pins 14 on IC2 and IC3 are grounded through S1 which inhibits their operation. The operation of IC1 is not inhibited and tone A is gated out since there is a simulated fully quieted signal input.

When S2 is in the TEST position and S1 is in the position B, a high is applied to the base of Q3. This duplicates the "PL" indicate signal and thereby enables the voting process. The ground is removed from pin 14 on IC2 and IC3, and since there is no noise input, both IC's are enabled. With IC3 enabled, the emitter circuit of Q10 is opened allowing the collector to rise to 9.0 V dc. This, as previously described, disables IC1. Therefore, tone B is the only tone that is gated out.

3.8 TONE GENERATORS

Identical tone generators A and B operate on fixed frequencies of 2250 Hz and 2325 Hz, respectively. The frequency of each generator

is determined by a Motorola "Vibrasender" reed. This resonant reed is a precision built device which requires not adjustment to maintain its frequency within ±0.15% of that specified. It consists of a tuned cantilever reed of special steel mounted on a rugged base with a coil and two permanent magnets. The entire assembly is spring-mounted and hermetically sealed in a metal housing to insure long life at peak performance under all types of conditions. The design of the reed eliminates the need for servicing throughout its useful life. The reed is a plug-in device which may be easily removed and replaced for circuit testing.

Each tone generator consists of a two-stage amplifier utilizing regenerative feedback to obtain continuous oscillation. When power is applied to the voting module, the current surge is sufficient to initiate reed operation. The resonant feed acts as a very high Q, narrow band-energy from the primary to the secondary winding. The sinusoidual reed output is amplified by Q14 (tone generator A) or Q12 (tone generator B). Regenerative feedback from the collector of this transistor is obtained through a resistor-capacitor combination to the first stage amplifier Q13 (tone generator A) or Q11 (tone generator B). Since the reed primary is connected in the collector circuit of this transistor, the amplified signal maintains reed operation.

Tone generator A output is obtained from the wiper of TONE A LEVEL control R74 located in the emitter circuit of Q14. Likewise, tone generator B output is obtained from the wiper of TONE B LEVEL control R35 located in the emitter circuit of Q12. These controls which are accessible through the voting module front panel, allow setting the desired output level of each tone generator.

4. MAINTENANCE

4.1 GENERAL

The voting encoder module may be serviced with the module physically connected to the encoder chassis or removed from the chassis and tested in a bench test setup. Personnel must be thoroughly familiar with the voting module theory of operation and servicing information before attempting maintenance procedures.

The following maintenance procedures are designed to verify that the module is properly operating and to aid in isolating a malfunction to a particular circuit stage. Once a malfunction is isolated to a stage, reference can be made to the schematic diagram for terminal voltages and component resistances to aid in locating the defective part.

NOTE

If the module is not voting at the correct levels or the tone generators outputs are not correct, refer to the proper system adjustment procedure.

4.2 SERVICING VOTING ENCODER MODULE IN CHASSIS

The voting module may be serviced while connected to the chassis. Access to the circuitry is gained by using extender board TLN8799 to extend the voting module out of the chassis.

NOTE

The following procedures do not measure the gain of the noise amplifier (Q1 and Q2). This measurement is best accomplished with the voting module removed from the chassis.

(1) Adjust receiver to obtain a no signal (maximum noise) input to the voting module.

(2) Place NORMAL-TEST switch (S2) in TEST position and OFF-A-B switch (S1) in OFF position. Observe that A light (LED 2) and B light (LED 1) are extinguished. If lights are not extinguished, use dc voltmeter and check for 8 V dc, minimum, at collector of Q3.

(3) Use dc voltmeter and check for 6.6 V dc at module connector pin 17.

(4) Place OFF-A-B switch (S1) in A position. (Switch S2 remains in TEST position.) Observe that A light (LED 2) illuminates and that B light (LED 1) remains extinguished. If A light is not illuminated, use dc voltmeter and check for 0.7 V dc, minimum, at IC1-6 and -7. If B light is not extinguished, use dc voltmeter and check for 0.5 V dc, maximum, at IC2-6 and -7.

(5) Place NORMAL-TEST switch (S2) in NORMAL position. Use dc voltmeter and check for 0.5 V dc, maximum, at module connector pin 17.

(6) Place OFF-A-B switch (S1) in B position and place NORMAL-TEST switch (S2) in TEST

position. Observe that A light (LED 2) extinguishes and that B light (LED 1) illuminates. If A light is not extinguished, use dc voltmeter and check for 1.8 V dc, minimum on IC3-6 and -7. If B light is not illuminated, use dc voltmeter and check for 0.75 V dc, minimum, on IC2-6 and -7.

(7) Remove "Vibrasender" reed A from socket. (Switches S1 and S2 remain in B and TEST positions, respectively.) Rotate LEVEL B control (R35) to obtain maximum tone generator B output. Use ac voltmeter and check for 100 mV rms, minimum, at module connector pin 15. Re-install "Vibrasender" reed A in its socket at conclusion of measurement.

(8) Remove "Vibrasender" reed B from socket. Place OFF-A-B switch (S1) to A position. (Switch S2 remains in TEST position.) Rotate LEVEL A control (R74) to obtain maximum tone generator A output. Use ac voltmeter and check for 100 mV rms, minimum, at module connector pin 15. Re-install "Vibrasender" reed B in its socket at conclusion of measurement.

NOTE

The following check is only intended to verify that the noise amplifier output is present at the inputs of IC1, IC2, and IC3. Due to the signal characteristics and the low signal level present at these circuit points, an exact voltage level measurement is meaningless.

(9) Place NORMAL-TEST switch (S2) to NORMAL position. Use ac voltmeter and check for presence of noise signal at IC1-15, IC2-15, and IC3-15.

4.3 SERVICING VOTING ENCODER MODULE OUT OF CHASSIS

When the voting module is to be serviced while removed from the encoder chassis, connect the following power, input signals, and loads to the module connector.

PIN NO.	CONNECT
1	Ground
3	Audio Oscillator *
8	9.6 V dc
12	13.6 V dc
15	2.7 k resistor to ground
17	13.6 V dc through a 3.3 k resistor

* Audio oscillator settings and connection specified in procedure.

(1) Place NORMAL-TEST switch (S2) in TEST position and OFF-A-B switch (S1) in OFF position. Observe that A light (LED 2) and B light (LED 1) are extinguished. If lights are not extinguished, use dc voltmeter and check for 8 V dc, minimum, at collector of Q3.

(2) Use dc voltmeter and check for A+ (13.6 V dc) at module connector pin 17.

(3) Place OFF-A-B switch (S1) in A position. (Switch S2 remains in TEST position.) Observe that A light (LED 2) illuminates and that B light (LED 1) remains extinguished. If A light is not illuminated, use dc voltmeter and check for 0.7 V dc, minimum, at IC1-6 and -7. If B light is not extinguished, use dc voltmeter and check for 0.5 vdc, maximum, at IC2-6 and -7.

(4) Place OFF-A-B switch (S1) in B position. (Switch S2 remains in TEST position.) Observe that A light (LED 2) extinguishes and that B light (LED 1) illuminates. If A light is not extinguished, use dc voltmeter and check for 1.8 V dc, minimum, on IC3-6 and -7. If B light is not illuminated, use dc voltmeter and check for 0.75 V dc, minimum, on IC2-7 and -7.

NOTE

In steps (5) and (6) the ac voltmeter required make measurements is connected in parallel with the 2.7 k load resistor at module connector pin 15.

(5) Remove "Vibrasender" reed A from socket. (Switches S1 and S2 remain in B and TEST positions, respectively.) Rotate LEVEL B control (R35) to obtain maximum tone generator B output. Use ac voltmeter and check for 100 mV rms, minimum, at module connector pin 15. Re-install "Vibrasender" reed A in its socket at conclusion of measurement.

(6) Remove "Vibrasender" reed B from socket. Place OFF-A-B switch (S1) to A position. (Switch S2 remains in TEST position.) Rotate LEVEL A control (R74) to obtain maximum tone generator A output. Use ac voltmeter and check for 100 mV rms, minimum, at module connector pin 15. Re-install "Vibrasender" B in its socket at conclusion of measurement.

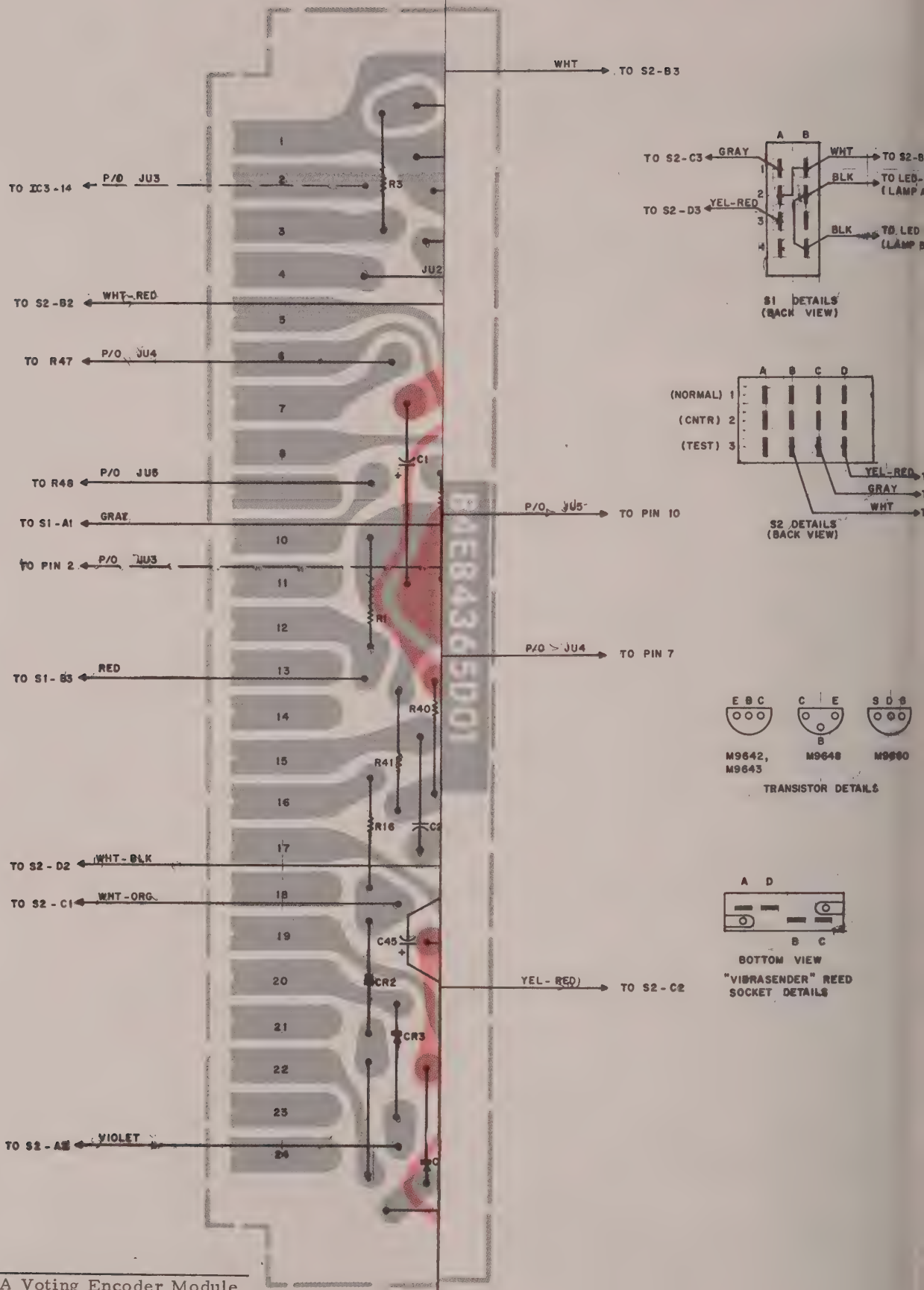
(7) Connect audio oscillator output to module connector pin 3. Adjust audio oscillator output to 100 kHz at 0.1 V rms.

(8) Place NORMAL-TEST switch (S2) in NORMAL position. Use ac voltmeter and check for 0.25 V rms (8 dB of gain) at the collector of Q3.

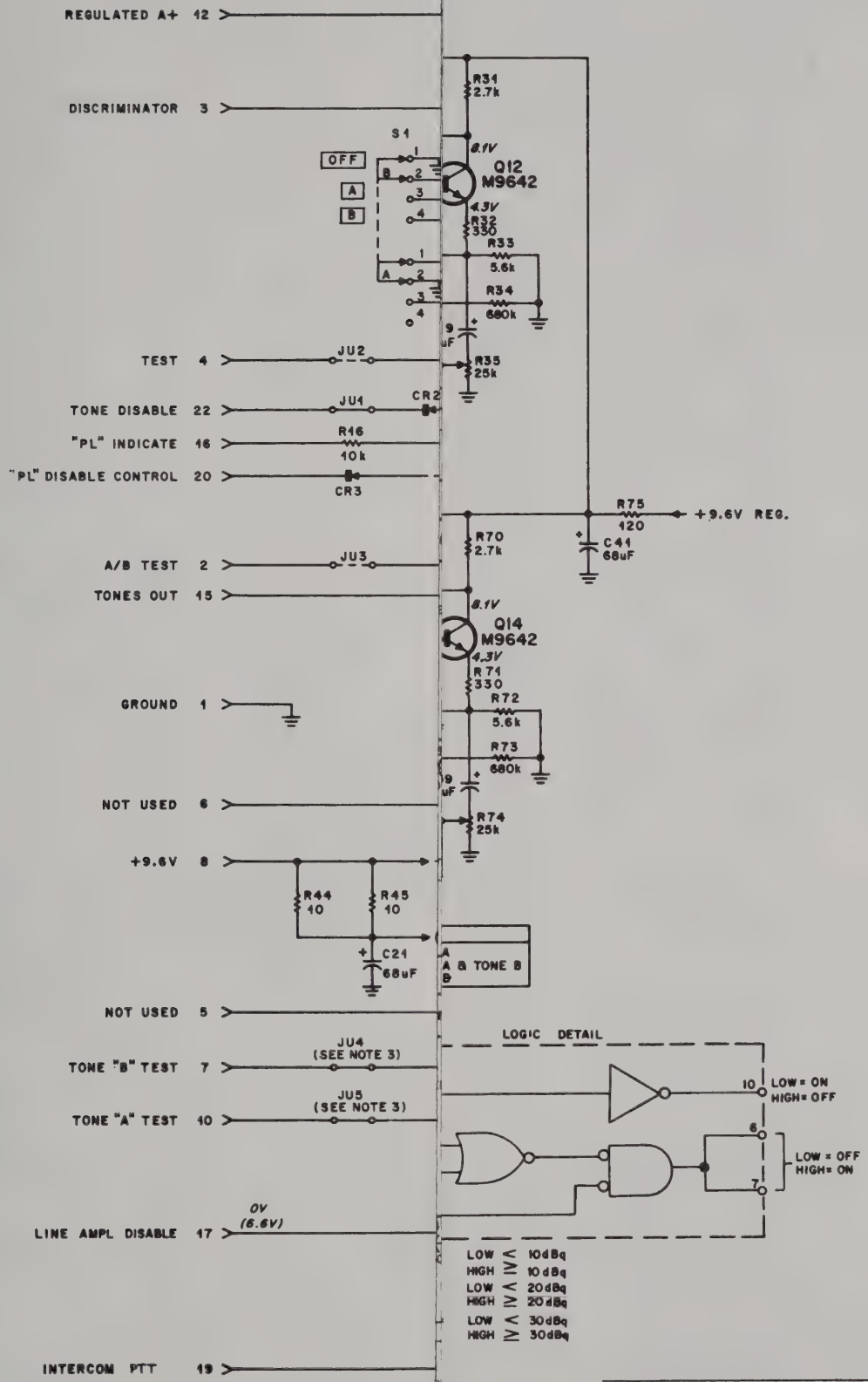
NOTE

The following check is only intended to verify that the noise amplifier output is present at the inputs of IC1, IC2, and IC3. Due to the signal characteristics and the low signal level present at these circuit points, an exact voltage level measurement is meaningless.

(9) Use ac voltmeter and check for presence of signal at IC1-15, IC2-15, and IC3-15.

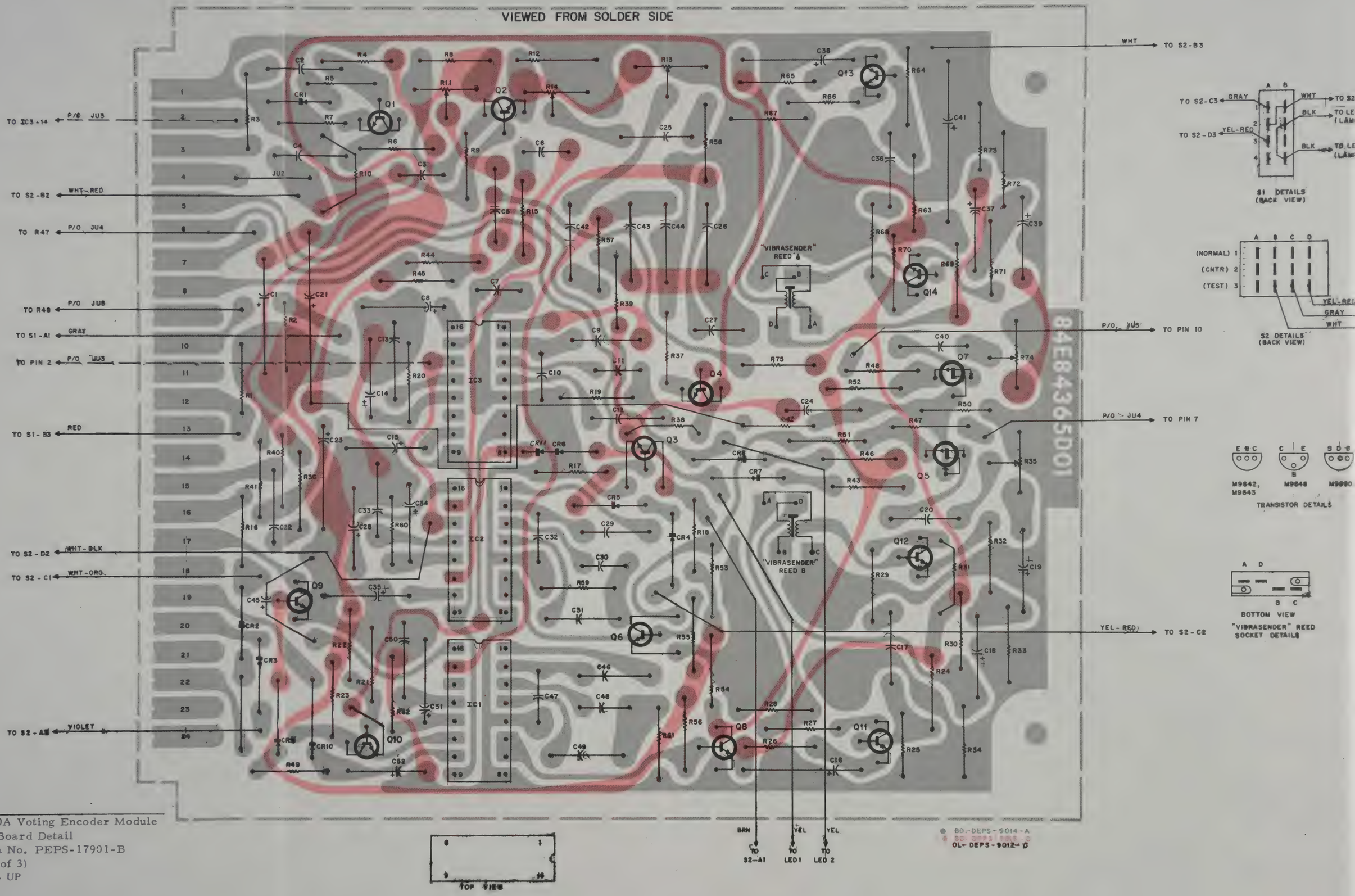


T1.N1460A Voting Encoder Module
Circuit Board Detail
Motorola No. PEPS-17901-B
(Sheet 1 of 3)
7/15/81- UP

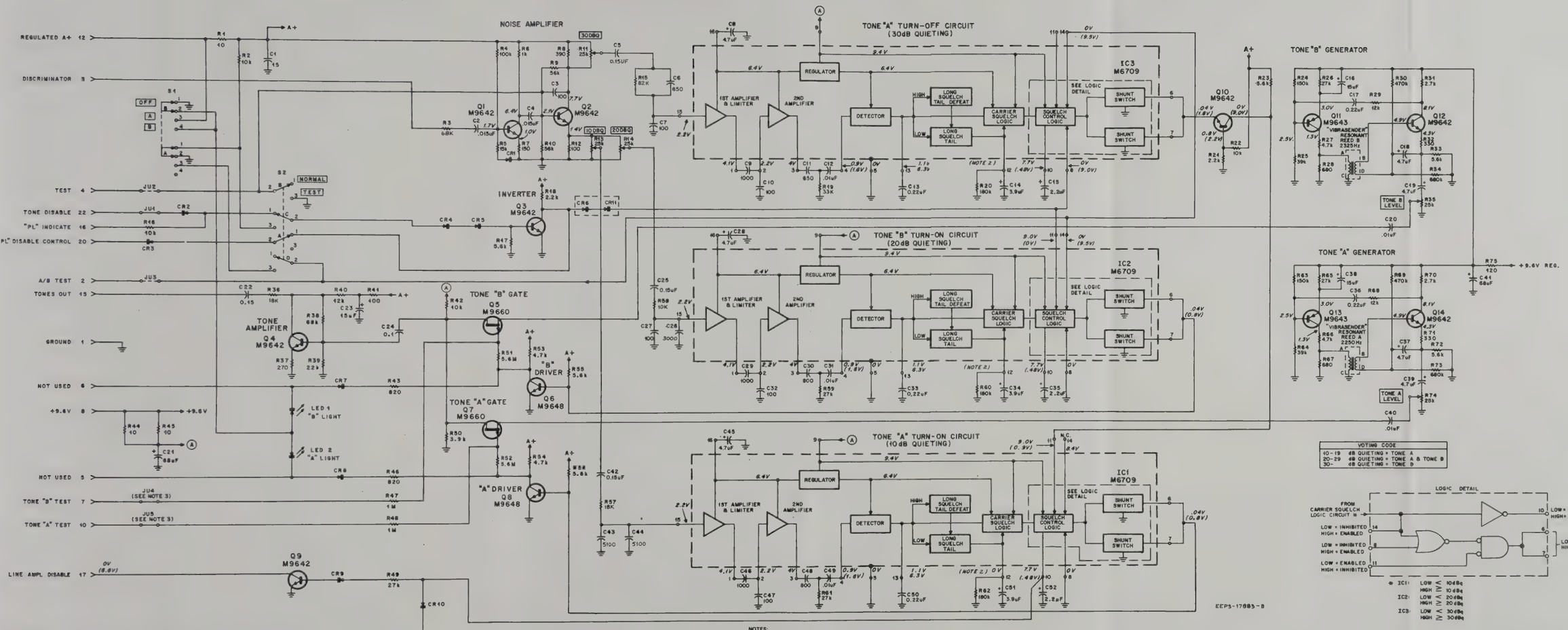


VOTING ENCODER MODULE

TLN1460A Voting Encoder Module
Schematic Diagram
Motc ola No. PEPS-17919-B
(Sheet 2 of 3)
7/15/81- UP



TLN1460A Voting Encoder Module
Circuit Board Detail
Motorola No. PEPS-17901-B
(Sheet 1 of 3)
7/15/81- UP



NOTES:

1. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN PICOFARADS.
2. VARYING VOLTAGE BETWEEN 0.0 V DC AND 5.5 V DC.
3. IN SPECTRA TAC TOTAL AREA COVERAGE APPLICATIONS CUT JUMPERS JU4 AND JU5.

VOTING ENCODER MODULE

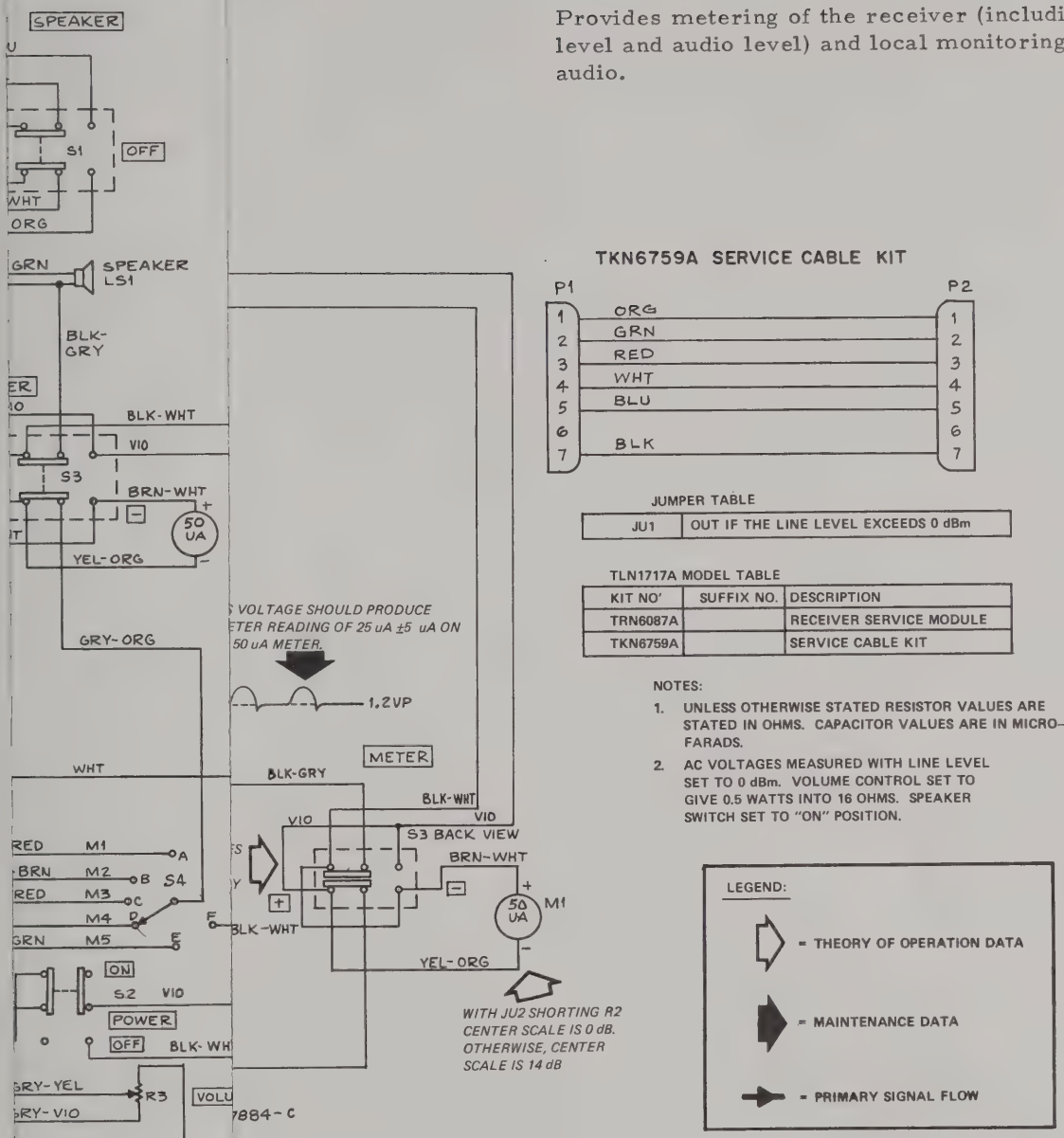
TLN1460A Voting Encoder Module
Schematic Diagram
Motorola No. PEPS-17919-B
(Sheet 2 of 3)
7/15/81- UP

RECEIVER SERVICE MODULE

MODEL TLN1717A

FUNCTION

Provides metering of the receiver (including line level and audio level) and local monitoring of audio.



TKN6759A SERVICE CABLE KIT

JUMPER TABLE

JU1	OUT IF THE LINE LEVEL EXCEEDS 0 dBm

TLN1717A MODEL TABLE

KIT NO'	SUFFIX NO.	DESCRIPTION
TRN6087A		RECEIVER SERVICE MODULE
TKN6759A		SERVICE CABLE KIT

NOTES:

1. UNLESS OTHERWISE STATED RESISTOR VALUES ARE STATED IN OHMS. CAPACITOR VALUES ARE IN MICRO-FARADS.
2. AC VOLTAGES MEASURED WITH LINE LEVEL SET TO 0 dBm. VOLUME CONTROL SET TO GIVE 0.5 WATTS INTO 16 OHMS. SPEAKER SWITCH SET TO "ON" POSITION.

6E31-B

LOCATION
BASE RCUIT
EMITTER RCUIT
D CIRCUIT

RECEIVER SERVICE MODULE

PARTS LIST

TLN4915 Voting Encoder Module PL-3495-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 100V unless otherwise stated
C1	23-865136	15 ±20%; 25V
C2	8-83813H32	.015
C3	21-84426B06	100 pF ±5%; 500V
C4	8-83813H32	.015
C5	8D83813H07	.15
C6	21-859944	300 pF ±5%; 500V
C7	21-84426B06	100 pF ±5%; 500V
C8	23-84762H07	4.7 ±20%; 10V
C9	21-84493B05	1000 pF; 200V
C10	21-84426B06	100 pF ±5%; 500V
C11	21-848236	650 pF ±5%; 300V
C12	8-83813H31	.01
C13	8-83813H11	.22; 50V
C14	23-84762H08	3.9 ±20%; 15V
C15	23-84762H04	2.2 ±20%; 25V
C16	23-865136	15 ±20%; 25V
C17	8-83813H11	.22; 50V
C18	23-84762H07	4.7 ±20%; 10V
C19	23-84762H07	4.7 ±20%; 10V
C20	8-83813H31	.01
C21	23-865594	68; 15V
C22	8-83813H07	.15; 50V
C23	23-865136	15 ±20%; 25V
C24	8-83813H06	.1
C25	8-83813H07	.15; 50V
C26	21K863394	3000 pF
C27	21-84426B06	100 pF ±5%; 500V
C28	23-84762H07	4.7 ±20%; 10V
C29	21-84493B05	1000 pF; 200V
C30	21-840049	800 pF ±5%; 300V
C31	8-83813H31	.01
C32	21-84426B06	100 pF ±5%; 500V
C33	8-83813H11	.22; 50V
C34	23-84762H08	3.9 ±20%; 15V
C35	23-84762H04	2.2 ±20%; 25V
C36	8-83813H11	.22; 50V
C37	23-84762H07	4.7 ±20%; 10V
C38	23-865136	15 ±20%; 25V
C39	23-84762H07	4.7 ±20%; 10V
C40	8-83813H31	.01
C41	23-865594	68; 15V
C42	8-83813H07	.15; 50V
C43	21K847354	5100 pF
C44	21K847354	5100 pF
C45	23-84762H07	4.7 ±20%; 10V
C46	21-84493B05	1000 pF; 200V
C47	21-84426B06	100 pF ±5%; 500V
C48	21-840049	800 pF ±5%; 300V
C49	8-83813H31	.01
C50	8-83813H11	.22; 50V
C51	23-84762H08	3.9 ±20%; 15V
C52	23-84762H04	2.2 ±20%; 25V
		SEMICONDUCTOR DEVICE. diode: (See Note)
CR1 thru 5	48-82392B03	silicon
CR6 & CR11	1-80767B74	diode assembly
CR7 thru 10	48-82392B03	silicon
		INTEGRATED CIRCUIT:
IC1 thru 3	51-84267A09	type M6709
		LIGHT EMITTING DIODE:
LED1, 2	48-88245C01	breakdown voltage: 3V
		TRANSISTOR: (See Note)
Q1thru Q4	48-869642	N-P-N; type M9642
Q5	48-869660	field-effect; type M9660
Q6	48-869648	N-P-N; type M9648
Q7	48-869660	field-effect; type M9660
Q8	48-869648	N-P-N; type M9648
Q9	48-869642	N-P-N; type M9642
Q10	48-869642	N-P-N; type M9642
Q11	48-869643	P-N-P; type M9643
Q12	48-869642	N-P-N; type M9642
Q13	48-869643	P-N-P; type M9643
Q14	48-869642	N-P-N; type M9642

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		RESISTOR, fixed: ±10%; 1/4W; unless otherwise stated
R1	6-129755	10
R2	6-129225	10k
R3	6-129144	68k
R4	6-129226	100k
R5	6-127805	15k
R6	6-127802	1k
R7	6-129862	150
R8	6-129863	390
R9, 10	6-129242	56k
R11	18-83083G16	variable: 25k ±30%; linear
R12	6-129753	100
R13	18-83083G16	variable: 25k ±30%; linear
R14	18-83083G16	variable: 25k ±30%; linear
R15	6-129147	220k
R16	6-129225	10k
R17	6-129433	5.6k
R18	6-128689	2.2k
R19	6-127806	27k
R20	6-129229	180k
R21	6-128689	2.2k
R22	6-129225	10k
R23	6-129433	5.6k
R24	6-129146	150k
R25	6-128903	39k
R26	6-127806	27k
R27	6-127804	4.7k
R28	6-128599	680
R29	6-129230	12k
R30	6-129148	470k
R31	6-128688	2.7k
R32	6-129775	330
R33	6-129433	5.6k
R34	6-129010	680k
R35	18-83083G03	variable: 25k ±30%; "A" taper
R36	6-124C79	18k
R37	6-124C35	270
R38	6-129144	68k
R39	6-128685	22k
R40	6-129230	12k
R41	6-129753	100
R42	6-129225	10k
R43	6-129432	820
R44, 45	6-129755	10
R46	6-129432	820
R47, 48	6-129013	1 meg
R49	6-127806	27k
R50	6-129232	3.9k
R51, 52	6-124D40	5.6 meg
R53, 54	6-127804	4.7k
R55, 56	6-129433	5.6k
R57	6-128904	18k
R58	6-129225	10k
R59	6-127806	27k
R60	6-129229	180k
R61	6-127806	27k
R62	6-129229	180k
R63	6-129146	150k
R64	6-128903	39k
R65	6-127806	27k
R66	6-127804	4.7k
R67	6-128599	680
R68	6-129230	12k
R69	6-129148	470k
R70	6-128688	2.7k
R71	6-129775	330
R72	6-129433	5.6k
R73	6-129010	680k
R74	18-83083G03	variable: 25k ±30%; "A" taper
R75	6-129617	120
		SWITCH, slide:
S1	40-84291D01	3 lock positions
S2	40-83794G02	4 pdt (non-shorting)
		NON-REFERENCED ITEMS
	9-84906E02	SOCKET, integrated circuit; 3 req'd.
	9-84910C01	SOCKET, reed; 2 req'd
	42-10217A02	STRAP, cable
	43-82721C01	BUSHING, snap; 2 req'd.
	45-83914G01	GUIDE, card; 2 req'd.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		NON-REFERENCED ITEMS (Cont'd)
	1-80733B83	PANEL ASSEMBLY: includes: 64-84766E01 PANEL, screened; ref. parts S1 and S2
	1-80733B84	CIRCUIT BOARD ASSEMBLY: includes: 9-83011H01 CONTACT, receptacle; 16 req'd.; 43-865080 BUSHING, threaded; 2 req'd.
	1-80735B37	DIODE ASSEMBLY: includes: ref. parts LED 1 and LED 2

NOTE:
For optimum performance, replacement diodes and transistors must be ordered by Motorola part number.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6687A Receiver Service Module PL-3461-B

C1	23-82783B14	CAPACITOR, fixed: 1 uF ±10%, 15 V
C2, 9, 11	23-84538G04	15 uF ±10%, 20 V
C[illegible]	23-83214C02	15 uF ±20%, 25 V
[illegible]	21-82428B59	.01 uF +80-20%, 200 V
C8	23-84538G06	47 uF ±20%, 20 V
C[illegible]	23-83210A19	500 uF +150-10%, 20 V
CR1, 2	48-82178A04	DIODE: (SEE NOTE) germanium
DS1	48-88245C08	LIGHT EMITTING DIODE: RED
J1-J4	50-83208B03	SPEAKER: 16 ohms, 3x5"
M1	72-83319G01	METER, DC: 0-50 mA
Q1	48-869594	TRANSISTOR: (SEE NOTE) NPN; type M9594
Q2, 3, 4	48-869642	NPN; type M9642
Q5	48-869428	NPN; type M9428
Q6	48-869439	PNP; type M9439
R1	6-124A99	RESISTOR, fixed: ±10%, 1/4W unless otherwise stated 120k ±5%
R2	6-124A92	62k ±5%
R3	18-807272	var; 25k; 20%
R4, 5, 17	6-124C89	47k
R6, 16	6-124C69	1k
R7	6-124G39	390
R8	6-124A60	3k ±5%
R9	6-124C31	180
R10	6-124C51	270
R11, 12	6-124D70	10, 1/2 W
R13	6-124C05	15, 1/2W
R14	6-124A77	18k
R15	6-124C85	33k
R18	6-124C67	4.7k
R19	6-124A71	8.2k ±5%
R20	6-124C01	10, 1/2 W
R21	6-124G21	100
R22	6-125C43	560; 1/2 W
S1, 2, 3	4C-83204B01	SWITCH: (3pdt)
S4	40-84305B04	rotary

NON-REFERENCED ITEMS

	7-83653K01	BRACKET, meter mounting
	43-865080	BUSHING; 6 req'd.
	9-83011H01	RECEPTACLE, board mounting 12 req'd.
	36-82766H03	KNOB

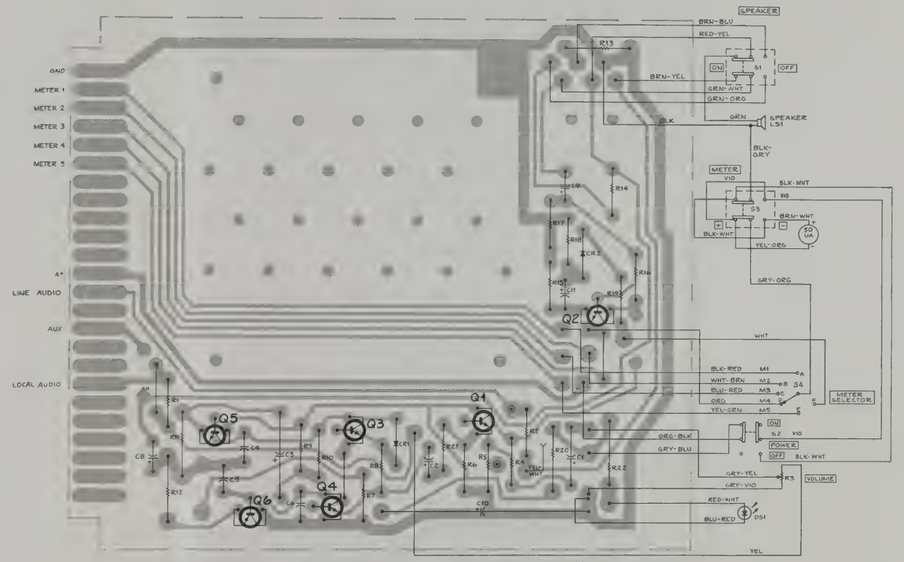
NOTE:
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TKN6759A Service Cable Kit PL-3515-A

P1, 2	28-84208B01	CONNECTOR: plug; metering (2 req'd.)

NON-REFERENCED ITEMS

	30-84761G01	CABLE; shielded; 6 conductor (11 inches)
	42-84834G01	CLIP; cable (2 req'd.)



SHOWN FROM SOLDER SIDE

REVISIONS 68P81026E31-B

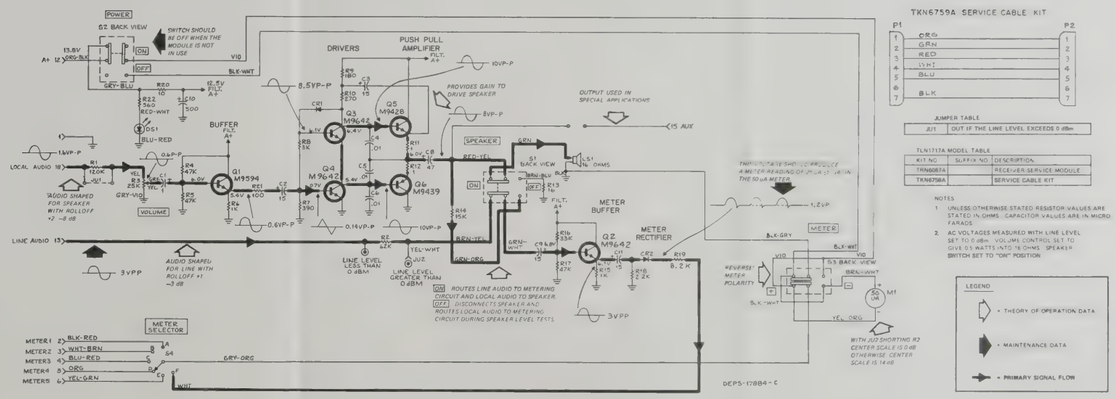
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6687A	C7	DELETED, WAS 8-82905C02 .022 uF ±10%, 50 V	Q1 BASE CIRCUIT
	R19	FROM 6-10621C91 10K ±1%, 1/8 W; TO 6-124A71 8.2K ±5%, 1/4 W	Q2 EMITTER CIRCUIT
	R23	DELETED WAS 6-124A75	S4-D CIRCUIT

RECEIVER SERVICE MODULE

MODEL TLN1717A

FUNCTION

Provides metering of the receiver (including line level and audio level) and local monitoring of audio.



TKN6759A SERVICE CABLE KIT

JUMPER TABLE

JU1	OUT IF THE LINE LEVEL EXCEEDS 0 dBm

TLN1717A MODEL TABLE

KIT NO	SUFFIX NO.	DESCRIPTION
TRN6687A		RECEIVER SERVICE MODULE
TKN6759A		SERVICE CABLE KIT

NOTES
1. UNLESS OTHERWISE STATED RESISTOR VALUES ARE STATED IN OHMS. CAPACITOR VALUES ARE IN MICRO FARADS.
2. AC VOLTAGES MEASURED WITH LINE LEVEL SET TO 0 dBm. VOLUME CONTROL SET TO GIVE 0.5 WATTS INTO 16 OHMS. SPEAKER SWITCH SET TO "ON" POSITION.

LEGEND
- THEORY OF OPERATION DATA
- MAINTENANCE DATA
- PRIMARY SIGNAL FLOW

RECEIVER SERVICE MODULE

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

"MICOR" "SENSITRON" LOW BAND RECEIVER RF & IF BOARD

TLB6850B SERIES

MODEL	FREQUENCY RANGE (MHz)
TLB6851B	25-30
TLB6852B	30-36
TLB6853B	36-42
TLB6854B	42-50

TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE		50 ohms
RF FREQUENCY RANGE		25-50 MHz in four ranges
CHANNEL SPACING		20 kHz
NUMBER OF CHANNELS		1 (can accommodate up to 4 for special applications)
SELECTIVITY EIA SINAD		-100 dB @ ±20 kHz
INTERMODULATION EIA SINAD		-80 dB
MODULATION ACCEPTANCE EIA		±7 kHz
SENSITIVITY	20 dB QUIETING	0.35 microvolt or less
	EIA SINAD	0.25 microvolt or less
OSCILLATOR (CHANNEL ELEMENT) STABILITY		Channel element maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference). Channel elements with frequency stability of ±.0002% are also available.
SPURIOUS & IMAGE REJECTION		-100 dB minimum
POWER REQUIREMENTS		Regulated 9.1 to 10.1 volts dc @ 70 mA. +13.8 volts dc @ 12 mA.
CONSTRUCTION		Fully solid-state, two integrated circuits.
RECEIVER TYPE		FM, superheterodyne, single conversion
INTERMEDIATE FREQUENCY		5.26 MHz (5.36 MHz in shifted i-f receivers)
CRYSTAL FILTER TYPE		Dual resonator, mode coupled, monolithic crystals
METERING		Four test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set or any 50 microampere meter with 2,000 ohms equivalent series resistance. Built-in receiver service kit is also available for metering.

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

68P81026E34-C
6/12/81- UP

1. DESCRIPTION

This fully solid-state receiver rf and i-f circuit board incorporates two integrated circuits, two i-f crystal filters, three transistors, plug-in channel elements, and a crystal discriminator.

All circuits are constructed on a single plug-in circuit board which is easily removed and replaced. All external dc and audio connections are made at a single row of pins which eliminate interconnecting wires; rf input is provided by a single plug-in coaxial cable. Circuit board plating is on both sides of the board with all components mounted on the back side. All alignment points are accessible from the front of the receiver.

This board produces a low-noise audio signal from an "on-channel" frequency modulated rf carrier.

2. CIRCUIT ANALYSIS

This receiver or channel is a highly selective, crystal-controlled, single conversion FM receiver (less audio amplifier, squelch circuitry and speaker). Bandwidth and selectivity characteristics are determined by rf preselector coils and i-f crystal filters. Plug-in crystal oscillator modules (channel elements) provide stable frequency control. Highly reliable integrated circuits are used for all i-f amplification and limiting after the first crystal filter section. A crystal discriminator is used to provide high audio recovery from the i-f signal. Refer to schematic diagram for more circuit details.

3. MAINTENANCE

This section of the manual provides the maintenance procedures for the receiver rf and i-f section of the station. These tests include metering measurements and procedures for testing and troubleshooting, including integrated circuit check-out.

NOTE

The receiver rf and i-f board must be installed in the receiver for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation and testing to provide a good rf ground to all stages of the receiver. The board may be installed in the receiver or a "Micor" mobile radio set for testing.

3.1 20 dB QUIETING SENSITIVITY TEST

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service.

It may be performed using optional built-in receiver metering or a Motorola S1056B thru S1059B Portable Test Set with a TEK37A adapter. J101 can accommodate only the built-in metering set or the portable test set, but not both simultaneously. Plugging a portable test set in a receiver with built-in metering will disconnect the built-in metering cable.

NOTE

The receiver shield must be in place while performing this test.

3.1.1 Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" stations must also be PL disabled.

3.1.2 (Optional built-in receiver metering only.) Set the meter selector switch to position 6 and the speaker switch to the OFF position. Adjust the station VOLUME control for 50 uA as indicated on the meter.

3.1.3 (Portable test set only.) If a portable test set is used, an ac voltmeter is required. Connect an ac voltmeter across pins 1 and 18 of the audio control module. Adjust the LINE LEVEL control on the audio control module until 565 mV is measured on the ac voltmeter.

3.1.4 Connect a signal generator to the receiver antenna receptacle and adjust it to the receiver frequency. Set the rf output to minimum.

3.1.5 Increase the signal generator output until the meter reading drops to 5 uA on the built-in service kit, or 56.5 mV on the ac voltmeter. The generator output level now indicates the 20 dB quieting sensitivity and should be .35 microvolt, or less. Readjust the line level as described in the MAINTENANCE section in the front of the manual.

3.2 TROUBLESHOOTING

3.2.1 Circuit Measurements

3.2.1.1 General

A failure in almost any part of the rf and i-f section will produce an improper meter reading on one or more of the test points. Improper

alignment will also cause improper meter readings.

A "0" meter reading in position 3 or 5 indicates either (1) insufficient drive from a preceding stage or (2) a defective component at the metering point.

3.2.1.2 Procedure

3.2.1.2.1 (Portable test set only.) Connect the 20-pin plug of the adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve test set battery life. The plug acts as an on-off switch completing the battery circuit.

3.2.1.2.2 (Portable test set only.) Connect the white "metering" plug of the adapter cable to the metering receptacle on the receiver rf and i-f circuit board.

3.2.1.2.3 Compare the current readings in SELECTOR SWITCH positions 3, 4 and 5 with those in the following table. A low reading on meter position 3 indicates a defective channel element or multiplier circuit. An improper meter reading in position 4 or 5 readings indicate a malfunction elsewhere in the receiver, which can most rapidly be found by checking rf and i-f voltages, per the schematic diagram.

3.2.2 Alignment as a Troubleshooting Aid

Low test set readings, improper discriminator output, and otherwise abnormal performance are very often corrected by realignment. Therefore, alignment should be the first step performed for these symptoms. Many technicians prefer to use alignment as the first troubleshooting step in all cases.

TYPICAL RECEIVER RF & IF METER READINGS TABLE (NO INPUT SIGNAL APPLIED)

SELECTOR SWITCH POSITION	METER READING (uA)	CIRCUIT METERED
3	25 min. 42-50 MHz	Channel element output
	20 min. 25-42 MHz	
4	0 ±2	Discriminator output
5	2 to 10	3rd i-f amplifier and limiter

3.2.3 Isolating Defective Components

If test set readings are abnormal or other tests indicate abnormal performance, a troubleshooting procedure is desirable to isolate the defective component. The troubleshooting chart summarizes troubleshooting in a logical sequence. Normal rf voltages through the receiver are shown on the schematic diagram. These voltage readings are typical and can vary as much as 2 to 1 in a normal receiver because of an accumulation of small differences in gain or insertion loss of preceding circuitry. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component.

3.2.4 Troubleshooting Integrated Circuits

The IC's in the receiver i-f section may be checked by dc voltage measurements. Proper voltages are shown on the schematic diagram and in the tables that accompany the schematic diagram.

For several of the dc voltages the absolute value is not so important as is the relationship of one voltage to another. These relationships are clearly shown on the schematic diagram and the accompanying tables.

NOTE

To measure dc voltages on IC102, the discriminator shield (solder side of board) must be removed. This cover must be replaced to take meter and gain measurements after repairs have been completed.

3.2.5 Troubleshooting Crystals

A defective filter can best be found by measuring the rf voltages at the various points in the i-f section as indicated in the schematic diagram and receiver RF Voltage Table. A defective crystal will show an abnormally high insertion loss. Before making the check, verify, using an ohmmeter, that the center pins of all five filter crystals are connected to the associated crystal case. The resistance between the center pin and the case should be less than 1 ohm. The loss of this ground may cause errors in gain measurements because of the loss of shielding effectiveness.

Before replacing the discriminator crystal, verify that all components associated with the discriminator circuitry are not defective. Also, verify, in a manner similar to that used

for the filter crystals, that pin 2 is connected (less than 0.1 ohm) to the crystal case.

NOTE

When discriminator or filter crystals are replaced (except for Y102), they must be physically oriented so that the index asterisk on the top of the filter can is as shown on the schematic diagram or circuit board detail. The crystals are built to match specific input and output impedances and will not perform satisfactorily if reversed. Y102, if replaced, may be oriented in either direction.

3.3 FIELD-CONVERSION TO SHIFTED IF

The standard 5.26 MHz i-f can easily be converted to 5.36 MHz (shifted i-f). For two-receiver stations, the second receiver i-f is factory shifted from 5.26 MHz to 5.36 MHz when the difference between received carrier frequencies (channel spacing) is:

5.26 MHz ±40 kHz
2.63 MHz ±40 kHz
1.753 MHz ±40 kHz
1.315 MHz ±40 kHz

TLB6960A Shifted IF Crystal Kit is available from Motorola's crystal manufacturing facility (see FOREWORD at the front of this manual). This kit supplies the unique crystals required for converting to shifted i-f. The conversion procedure is as follows:

Refer to the parts list on the back of the schematic diagram and replace the standard crystals Y101 thru Y106 according to the reference symbols on the schematic diagram and the same symbols appearing in the parts covering the TLB6960A Shifted IF Crystal Kit.

Replace the K1003A Channel Element with KXN1021A Channel Element. (NOTE: Calculate the channel element frequency according to the formulas which apply for shifted i-f. Specify the correct required frequency when ordering the channel element.)

Realign the i-f channel to 5.36 MHz, using the standard procedure.

A. MENT PROCEDURE (Cont'd.)

Alignment may be performed using a Motorol
built-in station metering.

The test set adapter should be in the 100 mV

B. FREQUE

For the 25-30 M

$$f_o = \frac{f_c + 5.26}{2}$$

For the 30-36 (

$$f_o = \frac{f_c + 5.26}{3}$$

For the 42-50 M

$$f_o = \frac{f_c - 5.26}{3}$$

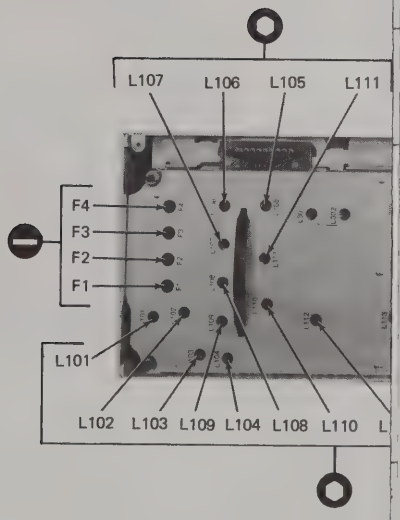
Where:

f_o = channel

f_c = rf carrie

2 or 3 = channe
5.26 = mixer
5.36 = mixer
freque

C. ADJUS



STAGE AND PROCEDURE
RF PRESELECTOR - If the preselector has been completely misaligned or the frequency is being changed, pre-position the slugs to the tops of the preselector cans (away from the board). Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal sufficient for an indication of about 20 microamperes on meter position 5. Peak L105 thru L109. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 microamperes. Repeat.
INJECTION AMPLIFIER OUTPUT - Adjust L103, L104 and L110 for a peak on meter position 5. Repeat.
ON-FREQUENCY ADJUSTMENT - Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, meter position 5 should indicate a rise when transmitter is keyed (if necessary connect an antenna to the station). Check position 4 reading with transmitter keyed. A "0" indicates an on-frequency condition. Adjust F1, warp capacitor for exact 0 reading. DO NOT READJUST L101 OR L102 AFTER THESE ADJUSTMENTS ARE MADE.
Perform 20 dB quieting sensitivity measurement as check of alignment.

for the filter crystals, that pin 2 is connected (less than 0.1 ohm) to the crystal case.

NOTE

When discriminator or filter crystals are replaced (except for Y102), they must be physically oriented so that the index asterisk on the top of the filter can is as shown on the schematic diagram or circuit board detail. The crystals are built to match specific input and output impedances and will not perform satisfactorily if reversed. Y102, if replaced, may be oriented in either direction.

3.3 FIELD-CONVERSION TO SHIFTED IF

The standard 5.26 MHz i-f can easily be converted to 5.36 MHz (shifted i-f). For two-receiver stations, the second receiver i-f is factory shifted from 5.26 MHz to 5.36 MHz when the difference between received carrier frequencies (channel spacing) is:

5.26 MHz ±40 kHz
2.63 MHz ±40 kHz
1.753 MHz ±40 kHz
1.315 MHz ±40 kHz

TLB6960A Shifted IF Crystal Kit is available from Motorola's crystal manufacturing facility (see FOREWORD at the front of this manual). This kit supplies the unique crystals required for converting to shifted i-f. The conversion procedure is as follows:

Refer to the parts list on the back of the schematic diagram and replace the standard crystals Y101 thru Y106 according to the reference symbols on the schematic diagram and the same symbols appearing in the parts covering the TLB6960A Shifted IF Crystal Kit.

Replace the K1003A Channel Element with KXN1021A Channel Element. (NOTE: Calculate the channel element frequency according to the formulas which apply for shifted i-f. Specify the correct required frequency when ordering the channel element.)

Realign the i-f channel to 5.36 MHz, using the standard procedure.

A. METERING NOTE

Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering.

The test set adapter should be in the 100 mV position for all metering.

B. FREQUENCY CALCULATIONS

For the 25-30 MHz range:

$$f_o = \frac{f_c + 5.26\ \text{MHz}}{2} \text{ or } \frac{f_c + 5.36\ \text{MHz}}{2}$$

For the 30-36 or 36-42 MHz range:

$$f_o = \frac{f_c + 5.26\ \text{MHz}}{3} \text{ or } \frac{f_c + 5.36\ \text{MHz}}{3}$$

For the 42-50 MHz range:

$$f_o = \frac{f_c - 5.26\ \text{MHz}}{3} \text{ or } \frac{f_c - 5.36\ \text{MHz}}{3}$$

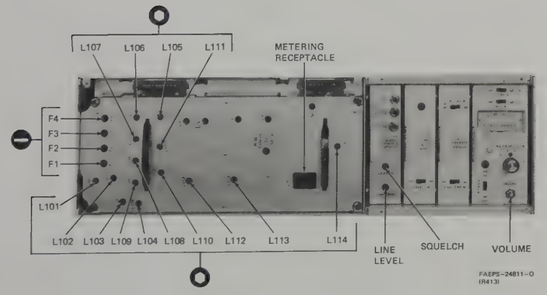
Where:

f_o = channel element frequency

f_c = rf carrier frequency

2 or 3 = channel element harmonic
5.26 = mixer output frequency (i-f frequency)
5.36 = mixer output frequency (shifted i-f frequency of some receivers)

C. ADJUSTMENT LOCATIONS



D. TYPICAL RECEIVER METER READINGS

(NO SIGNAL INPUT)

TEST SET SELECTOR SWITCH POSITION	READING (uA)	CIRCUIT METERED
3	25 Min 42-50 MHz	Channel Element Output
	20 Min 25-42 MHz	
4	0 ±2	Discriminator Output
5	2 to 10	3rd IF Amplifier and Limiter

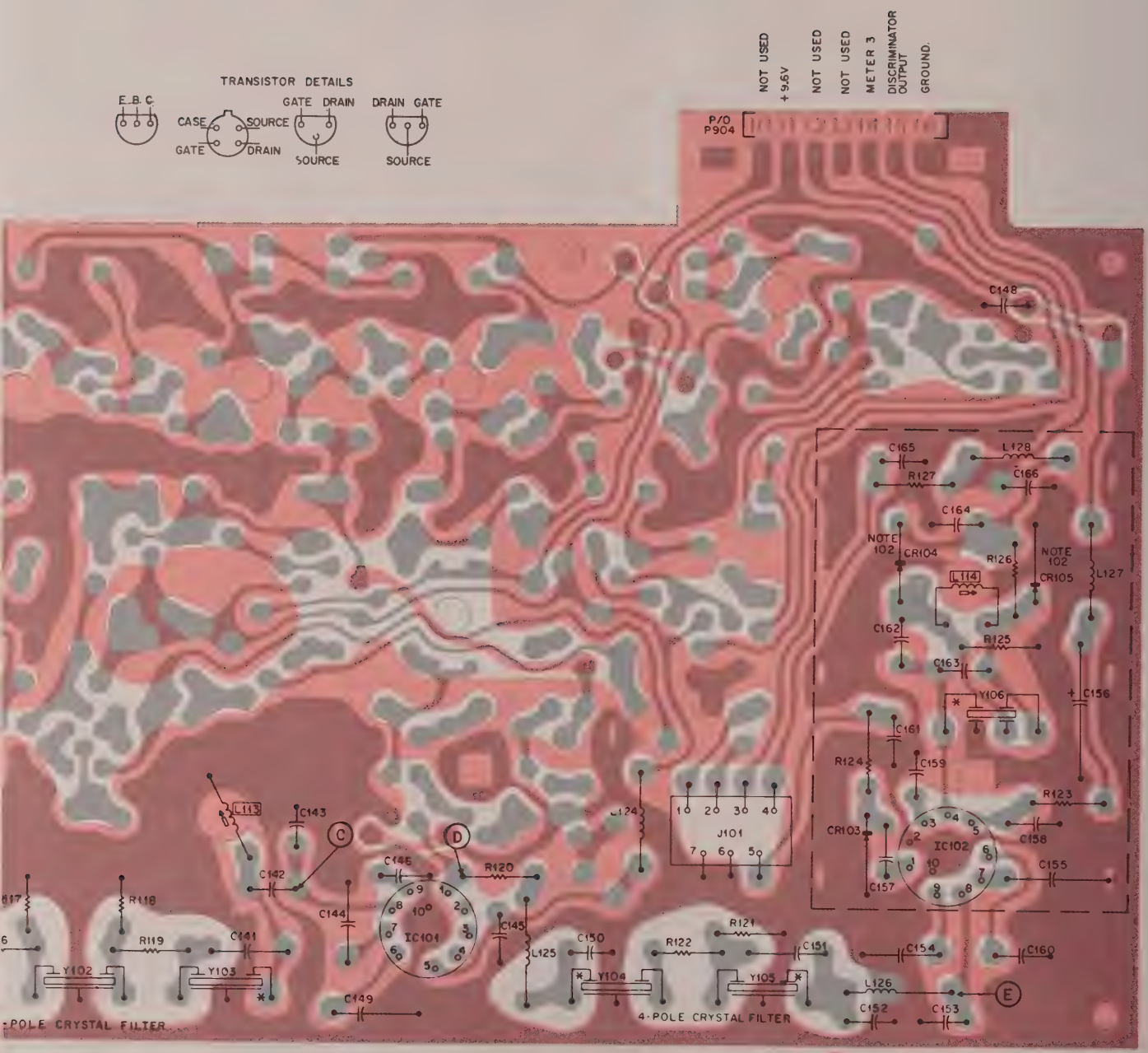
E. RECEIVER ALIGNMENT PROCEDURE

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
1	L101, L102, L103, L104	3	METER REV.	CHANNEL ELEMENT OUTPUT - If coils have been completely misaligned or the frequency is being changed, pre-position the coil slugs flush with the board. Adjust L101 and L102 for a peak indication on meter position 3.
2	L103, L104	3	METER REV.	INJECTION AMPLIFIER OUTPUT - Adjust L103 for a dip and L104 for a peak on meter position 3. Repeat alignment procedure steps 1 and 2.
3		6 (If Receiver Service Kit is used.)*	A or B (Test Set must be equipped with 5.26 MHz crystal in corresponding socket (or with 5.36 MHz crystal if receiver i-f is shifted)	DISCRIMINATOR - Unsquelch the receiver by turning the squelch control fully counterclockwise. "Private-Line" stations must also be PL disabled. Note meter indication. Insert 5.26 MHz (or 5.36 MHz) injection probe of test set into L113 opening of receiver shield being careful not to contact circuit board. Insert probe into hole far enough to obtain reading lower than 1/10 of that noted at beginning of this step (signal is "sprayed" into radio).
	L114	4		Adjust L114 for 0 center reading on top scale with selector switch of test set in position 4. Adjustment is critical and should be exactly on 0. Remove probe.
4	L110, L111, L112, L113	5	METER REV.	INTERMEDIATE FREQUENCY - If the i-f has been completely misaligned, pre-position slugs approximately 1/4 inch from the board, otherwise, proceed as follows. Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal sufficient for an indication of about 20 micro-amperes on meter position 5. Peak L110 thru L113. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 micro-amperes. Repeat.

* If the receiver service kit is not used, connect an ac voltmeter across pins 1 and 18 of the audio control module.

E. RECEIVER ALIGNMENT PROCEDURE (Cont'd.)

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
5	L105, L106, L107, L108, L109	5	METER REV.	RF PRESELECTOR - If the preselector has been completely misaligned or the frequency is being changed, pre-position the slugs to the tops of the preselector cans (away from the board). Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal sufficient for an indication of about 20 microamperes on meter position 5. Peak L105 thru L109. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 microamperes. Repeat.
6	L103, L104, L110	5	METER REV.	INJECTION AMPLIFIER OUTPUT - Adjust L103, L104 and L110 for a peak on meter position 5. Repeat.
7	F1, F2, F3, F4	5	METER REV.	ON-FREQUENCY ADJUSTMENT - Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, meter position 5 should indicate a rise when transmitter is keyed (if necessary connect an antenna to the station). Check position 4 reading with transmitter keyed. A "0" indicates an on-frequency condition. Adjust F1, warp capacitor for exact 0 reading. DO NOT READJUST L101 OR L102 AFTER THESE ADJUSTMENTS ARE MADE.
8	---	---	---	Perform 20 dB quieting sensitivity measurement as check of alignment.



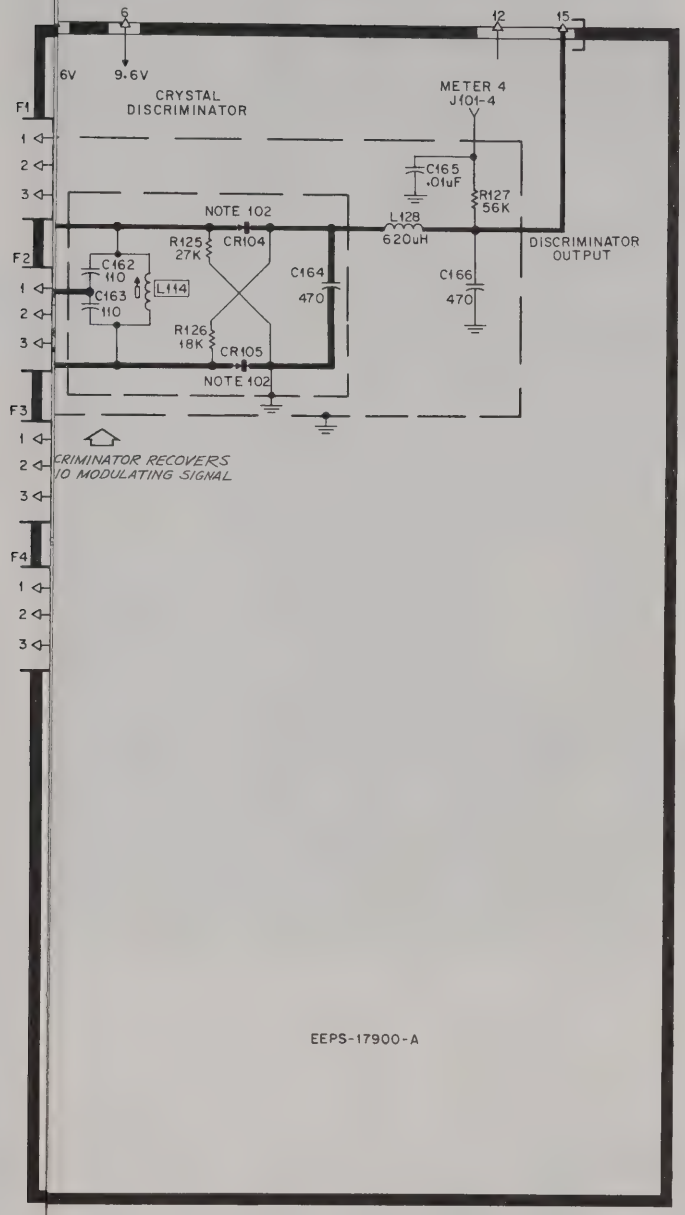
CRYSTAL DETAIL
(ALL EXCEPT Y102)

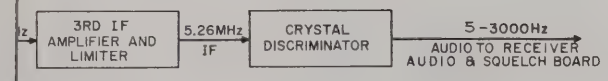
*

TANT – ORIENT INDEX * ON TOP OF
S SHOWN ON CIRCUIT BOARD DETAIL

COMPONENT SIDE
SOLDER SIDE

OL-EEPS-8654-E





RCV

PIN	
1	3.0 V
5	9.5 V
6	7.2 V
7	6.4 V
8	2.9 V
9	

1	3.0 V
3	LY H BYPA MEAS
4	6.3 V
5	9.3 V
6	7.2 V
7	6.4 V
8	2.9 V
9	

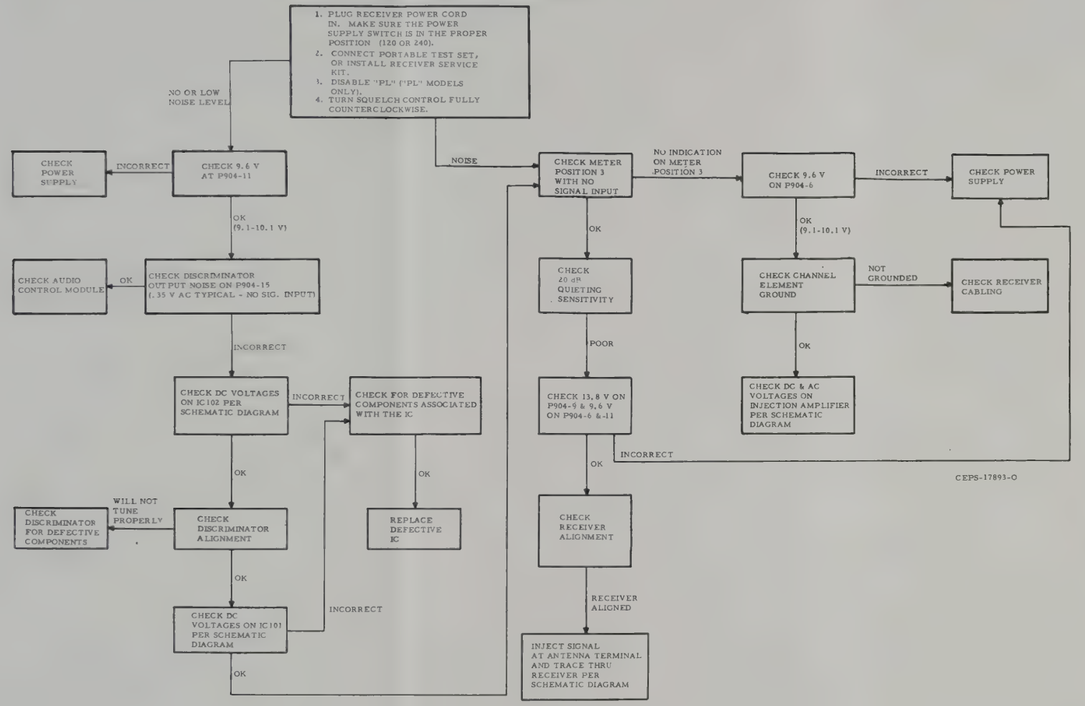
EEPS-17899-A

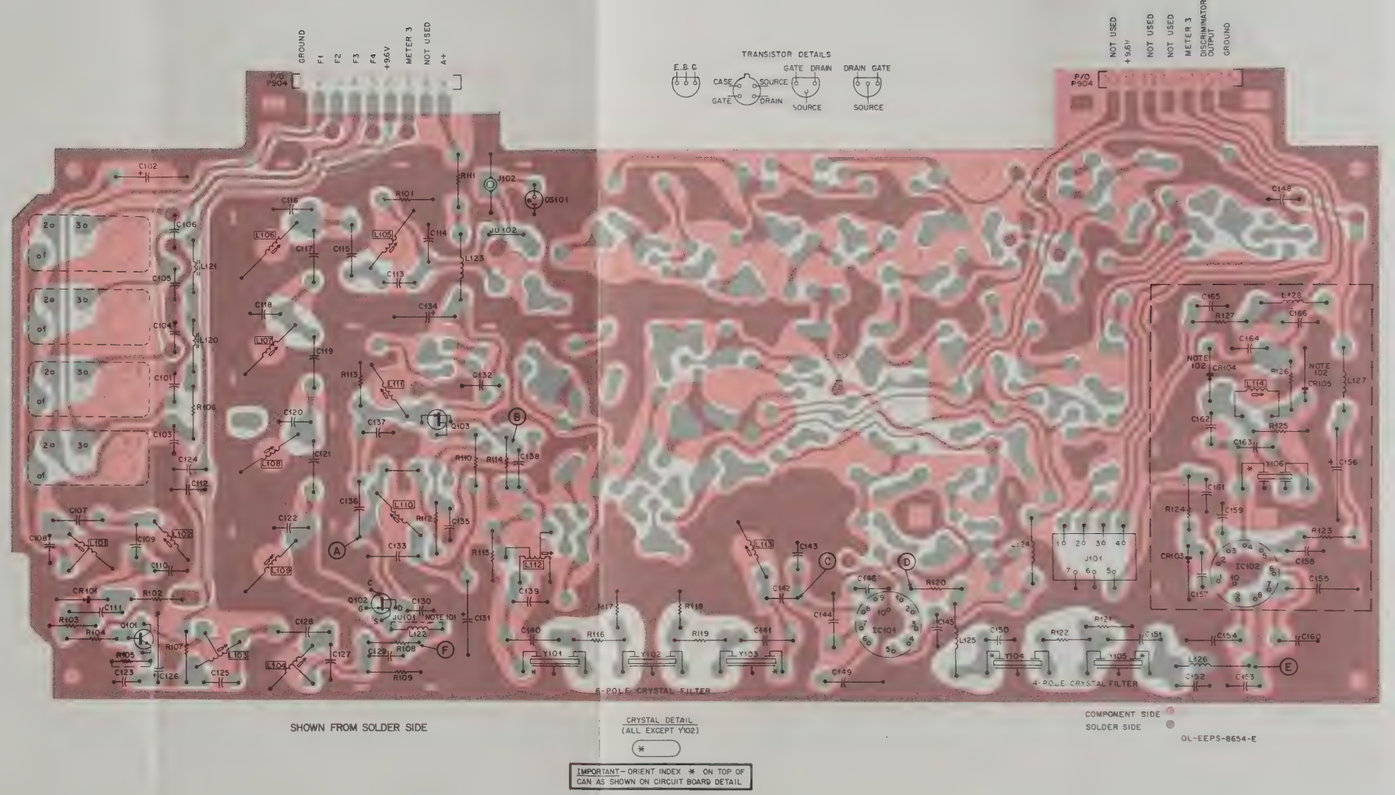
LOW BAND RECEIVER RF & IF BOARD

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

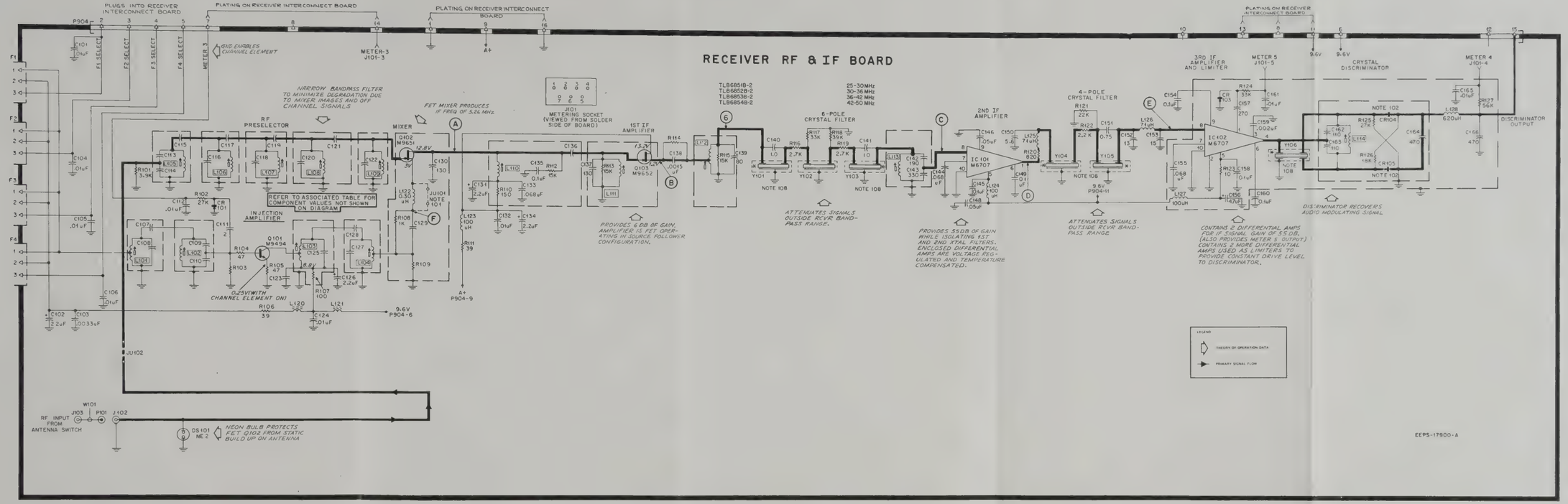
Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17895-B
7/15/81- UP

RECEIVER TROUBLESHOOTING CHART


1. PLUG RECEIVER POWER CORD IN. MAKE SURE THE POWER SUPPLY SWITCH IS IN THE PROPER POSITION (120 OR 240).
2. CONNECT PORTABLE TEST SET, OR INSTALL RECEIVER SERVICE KIT.
3. DISABLE "PL" ("PL" MODELS ONLY).
4. TURN SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
NO OR LOW NOISE LEVEL
NOISE
CHECK POWER SUPPLY
INCORRECT
CHECK 9.6 V AT P904-11
OK (9.1-10.1 V)
CHECK AUDIO CONTROL MODULE
OK
CHECK DISCRIMINATOR OUTPUT NOISE ON P904-15 (.35 V AC TYPICAL - NO SIG. INPUT)
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
INCORRECT
CHECK FOR DEFECTIVE COMPONENTS ASSOCIATED WITH THE IC
OK
CHECK DISCRIMINATOR FOR DEFECTIVE COMPONENTS
WILL NOT TUNE PROPERLY
CHECK DISCRIMINATOR ALIGNMENT
OK
REPLACE DEFECTIVE IC
CHECK DC VOLTAGES ON IC101 PER SCHEMATIC DIAGRAM
INCORRECT
OK
CHECK METER POSITION 3 WITH NO SIGNAL INPUT
NO INDICATION ON METER POSITION 3
CHECK 9.6 V ON P904-6
INCORRECT
CHECK POWER SUPPLY
OK (9.1-10.1 V)
CHECK CHANNEL ELEMENT GROUND
NOT GROUNDED
CHECK RECEIVER CABLING
OK
CHECK DC & AC VOLTAGES ON INJECTION AMPLIFIER PER SCHEMATIC DIAGRAM
OK
CHECK 20 dB QUIETING SENSITIVITY
POOR
CHECK 13.8 V ON P904-9 & 9.6 V ON P904-6 &-11
OK
CHECK RECEIVER ALIGNMENT
RECEIVER ALIGNED
INJECT SIGNAL AT ANTENNA TERMINAL AND TRACE THRU RECEIVER PER SCHEMATIC DIAGRAM
INCORRECT
CEPS-17893-O



RF & I-F Board
Circuit Board Detail and
Troubleshooting Chart
Motorola No. PEPS-17892-B
7/15/81- UP



RCVR CHAN. DC VOLTAGE TABLE FOR IC'S

PIN	VOLTAGE
	IC101
1	3.0 V (SLIGHTLY HIGHER THAN PINS 8 AND 9)
5	9.5 V (VARIES WITH 9.6 V LINE)
6	7.2 V
7	8.4 V
8	2.9 V (PINS 8 AND 9 MUST BE EQUAL)
9	
	IC102
1	3.0 V (PINS 1 AND 3 MUST BE EQUAL AND SLIGHTLY HIGHER THAN PINS 8 AND 9. PIN 1 MUST BE BYPASSED TO GND WITH .01 uF CAP WHEN MEASURED.)
3	
4	6.3 V (3.0 V LOWER THAN PIN 5)
5	9.3 V (VARIES WITH 9.6 V LINE)
6	7.2 V
7	8.4 V
8	2.9 V (PINS 8 AND 9 MUST BE EQUAL)
9	

EPS-6336-O

RF & IF COMPONENT VALUES

REFERENCE	25–30 MHz	30–36 MHz	36–42 MHz	42–50 MHz
C107	2	1.8	1.2	1.5
C108	75	56	40	47
C109	150	105	82	90
C110	150	105	90	90
C113	100	80	40	27
C114	220	270	220	160
C115	8	2.7	1.5	1.2
C116	68	51	36	24
C117	4.3	1.8	1.2	82
C118	75	51	36	24
C119	2.7	1.5	1.2	75
C120	75	51	36	24
C121	1.2	1.2	82	82
C122	22	12	11	5
C123	3300	3300	1500	1500
C125	75	51	39	43
C127	75	56	40	51
C128	2.7	1.5	1.2	1.2
C129	3300	3300	3300	1500
L122	NOT USED	NOT USED	NOT USED	0.30 uH
R103	3.9k	3.9k	3.0k	3.0k
R109	270	560	470	100

EPS-17897-O

RECEIVER RF & IF BOARD

101. JUMPER JU101 REPLACES CHOKE IN 25–42 MHz MODELS ONLY.
102. DIODE POLARITY CORRECT AS SHOWN FOR THE 25–42 MHz RANGES. DIODE POLARITY REVERSED FOR THE 42–50 MHz RANGE.
103. RECEIVER FREQUENCY CALCULATIONS: SEE ALIGNMENT PROCEDURE.
104. DASHED LINES REPRESENT SHIELDING.
105. RF MEASUREMENTS TAKEN WITH MOTOROLA SOLID-STATE DC MULTI-METER WITH PLUG-IN RF PROBE
106. RF MEASUREMENTS TAKEN WITH "EXTENDER" CHANNEL PROPERLY ALIGNED AND GAIN SET.
107. UNLESS OTHERWISE STATED, DC VOLTAGES GIVEN ARE NOMINAL AND MAY VARY ±25 PER CENT. DC VOLTAGES ARE MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND.
108. INDEX ASTERISK ON CRYSTAL CAN INDICATES PHYSICAL ORIENTATION.
109. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.

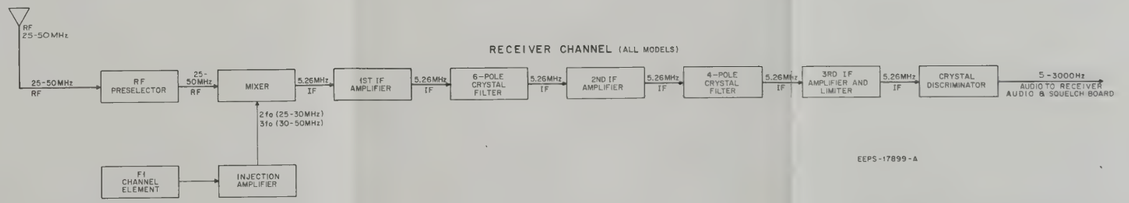
EPS-17898-O

RECEIVER CHANNEL RF VOLTAGE TABLE

SET RF INPUT AT ANT. TO OBTAIN (NOTE 105)	AT TEST POINT	SIG. GEN OUTPUT LEVEL SHOULD BE (MAY VARY APPROX 2 TO 1)	
0.5 V	A	8.0 mV	SIG. GEN. SET TO RECEIVER CHAN FREQ.
100 mV	B	8.0 mV	
	C	5.0 mV	
	D	16.0 uV	
	E	20.0 uV	

TEST POINT	RANGE	RF VOLTAGE (NOTE 105)
F	25-42 MHz	1.8–2.6 V
	42-50 MHz	0.8–1.5 V

EPS 6335-C



PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17895-B
7/15/81- UP

LOW BAND RECEIVER RF & IF BOARD

DESCRIPTION
2.2 uF ±20%; 25 V
.01 uF +80-20%; 200 V
.068 uF ±10%; 50 V
2.2 uF ±20%; 25 V
.01 uF +80-20%; 200 V
4.3
130
1500 ±10%; 100 V
80
1.0
190
330
.068 uF ±10%; 50 V
.01 uF +80-20%; 200 V
.05 uF +80-20%; 25 V
NOT USED
.05 uF +80-20%; 25 V
0.1 uF ±10%; 100 V
5.6 ±0.5 pF; NP0
0.75
13; NP0
15; NP0
0.1 uF ±10%; 100 V
.068 uF ±10%; 50 V
4.7 uF ±20%; 25 V
270 ±10%
0.1 uF ±10%; 100 V
2000 ±10%; 100 V
0.1 uF ±10%; 100 V
.01 uF +80-20%; 200 V
110; 200 V; N150
110
470 ±10%
.01 uF +80-20%; 200 V
470 ±10%
SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
germanium
NOT USED
germanium
silicon; hot carrier
LAMP, glow:
neon; type NE-2
INTEGRATED CIRCUIT: (SEE NOTE)
type M6707
CONNECTOR, receptacle:
female; 7-contact
female; coaxial; miniature type
COIL, RF:
8-1/2 turns; tapped; coded ORG includes tuning core (coded YEL)
8-1/2 turns; coded RED; includes tuning core (coded YEL)
8-1/2 turns; tapped; coded ORG includes tuning core (coded YEL)
8-1/2 turns; tapped; coded BLU includes tuning core (coded YEL)
8-1/2 turns; tapped; coded ORG includes tuning core (coded YEL)
7-1/2 turns; coded ORG; includes tuning core (coded YEL)
7-1/2 turns; coded BRN; includes tuning core (coded GRN)
7-1/2 turns; coded ORG; includes tuning core (coded YEL)
7-1/2 turns; coded BRN; includes tuning core (coded GRN)
7-1/2 turns; coded ORG; includes tuning core (coded YEL)
7-1/2 turns; coded BRN; includes tuning core (coded GRN)
7-1/2 turns; coded ORG; includes tuning core (coded YEL)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L109L,M	24-84114B03	12-1/2 turns; coded ORG; includes tuning core (coded YEL)
L109H,HH	24-84114B02	10-1/2 turns; coded RED; includes tuning core (coded YEL)
L110,111	24-84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L112	24-84258B02	27 turns; tapped; coded RED; includes tuning core (coded RED)
L113	24-84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L114	24-84258B03	40 turns; coded ORG; includes tuning core (not coded)
L120,121	24-83961B01	choke; ferrite bead type
L122L,M,H		NOT USED
L122HH	24-84270C01	choke; 0.30 uH
L123,124	24-82135G10	choke; 100 uH
L125,126	24-82835G26	choke; 71 uH
L127	24-82135G10	choke; 100 uH
L128	24-82135G01	choke; 620 uH
		TRANSISTOR: (SEE NOTE)
Q101	48-869494	NPN; type M9494
Q102	48-869651	field-effect; N-channel; type M9651
Q103	48-869652	field-effect; N-channel; type M9652
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R101	6-129232	3.9k
R102	6-129886	27k ±5%
R103L,M	6-129819	3.9k ±5%
R103H,HH	6-124A60	3k ±5%
R104,105	6-131274	47 ±5%
R106	6-131652	39
R107	6-129753	100
R108	6-129805	1k
R109L	6-131525	270 ±5%
R109M	6-129779	560 ±5%
R109H	6-129709	470 ±5%
R109HH	6-131524	100 ±5%
R110	6-129862	150
R111	6-131652	39
R112,113	6-129236	15k ±5%
R114	6-124A23	82 ±5%
R115	6-129236	15k ±5%
R116	6-129707	2.7k ±5%
R117	6-129526	33k ±5%
R118	6-129777	39k ±5%
R119	6-129707	2.7k ±5%
R120	6-129818	820 ±5%
R121	6-129667	22k ±5%
R122	6-129804	2.2k ±5%
R123	6-129755	10
R124	6-129526	33k ±5%
R125	6-129886	27k ±5%
R126	6-131526	18k ±5%
R127	6-128684	56k ±5%
		THERMISTOR:
RT301	6-83841B04	3.15k ±10% @ 25°C; 0.5 W
		CRYSTAL UNIT, quartz:
Y101	48-84259B01	i-f filter
Y102	48-84269B02	i-f filter
Y103	48-84259B01	i-f filter
Y104,105	48-84259B03	i-f filter
Y106	48-84104B01	discriminator

NOTE: For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part number.

TLB6960A Shifted IF Crystal Kit PL-2534-O

		CRYSTAL UNIT, quartz: 5.36 MHz:
Y101, Y103	48-84259B04	i-f filter
Y102	48-84259B05	i-f filter
Y104, Y105	48-84259B06	i-f filter
Y106	48-84104B02	discriminator filter

"MICOR" "SENSITRON" MID-BAND RECEIVER RF & IF BOARD

MODELS TLC6112A & TLC6112B

72-76 MHz

TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE		50 ohms
RF FREQUENCY RANGE		72-76 MHz
CHANNEL SPACING		20 kHz
SELECTIVITY EIA SINAD		-100 dB @ ±20 kHz
INTERMODULATION EIA SINAD		-80 dB
MODULATION ACCEPTANCE EIA		±7 kHz
SENSITIVITY	20 dB QUIETING	.5 microvolt or less
	EIA SINAD	.35 microvolt or less
OSCILLATOR (CHANNEL ELEMENT) STABILITY		Channel element maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference). Channel elements with frequency stability of ±.0002% are also available.
SPURIOUS & IMAGE REJECTION		-100 dB minimum (TLC6112A)
		-90 dB minimum (TLC6112B)
POWER REQUIREMENTS		Regulated 9.1 to 10.1 volts dc @ 70 mA. +13.8 volts dc @ 12 mA.
CONSTRUCTION		Fully solid-state, two integrated circuits
RECEIVER TYPE		FM, superheterodyne, single conversion
INTERMEDIATE FREQUENCY		5.26 MHz
CRYSTAL FILTER TYPE		Dual resonator, mode coupled, monolithic crystals
METERING		Three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set or any 50 microampere meter with 2,000 ohms equivalent series resistance. Built-in service metering also available.

1. DESCRIPTION

1.1 This fully solid-state receiver rf and i-f circuit board incorporates two integrated circuits, two i-f crystal filters, three transistors, plug-in channel elements, and a crystal discriminator.

1.2 All circuits are constructed on a single plug-in circuit board which is easily removed and replaced. All external dc and audio connections are made at a single row of pins which eliminate interconnecting wires; rf input is provided by a single plug-in coaxial cable. Circuit board plating is on both sides of the board with all components mounted on the back side. All alignment points are accessible from the front of the station.

1.3 This board produces a low-noise audio signal from an "on-channel" frequency modulated rf carrier.

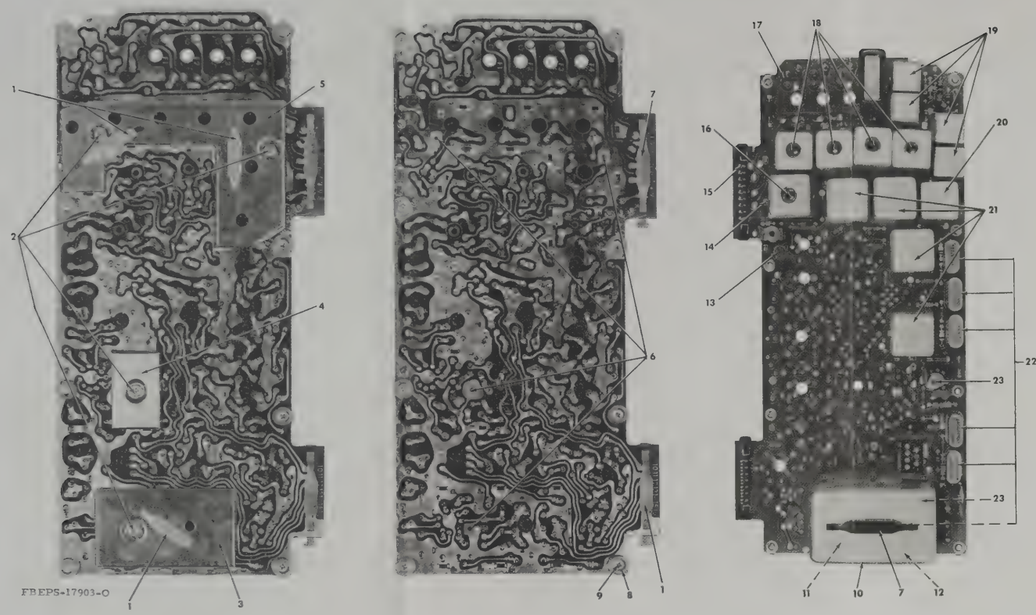
2. CIRCUIT ANALYSIS

This receiver board is a highly selective, crystal-controlled, single conversion FM receiver

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

68P81026E36-D
6/12/81- UP



PARTS LIST

Mechanical Parts PL-3493-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	55B84300B03	HANDLE
2	3S134212	LOCKSCREW, tapping: No. 4-40 x 5/16" "Phillips" hex head
3	26B84242B01	SHIELD
4	26B84244B01	SHIELD
5	26C84689B01	SHIELD
6	5B84220B01	GROMMET, "Nylon"
7	35B84300B02	HANDLE
8	42C84284B01	RETAINER, screw (8 req'd.)
9	3S136905	LOCKSCREW, tapping: No. 4-40 x 5/16" "Phillips" round head (8 req'd.)
10	26B84263B01	SHIELD
11	26B84250B04	CAN, square (staked)
12	26C84254B01	SPRING, retainer
13	7B84264B01	BRACKET, lamphholder
14	29S10434A29	RECEPTACLE, female (22 req'd.)
15	29C84028H01	TERMINAL, male
16	26B84248B01	CAN, square (staked)
17	29K855943	TERMINAL, pin; male
18	26B84248B02	CAN, square (staked)
19	26B84250B03	CAN, square (staked)
21	26B84250B02	CAN, square (staked)
22	14A84583B01	INSULATOR, crystal
23	4A49854	WASHER, spacer

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

LEGEND:
L = 25-30 MHz
M = 30-36 MHz
H = 36-42 MHz
HH = 42-50 MHz
NO CODE = All Models

TLB6850B Series Receiver RF & IF Boards PL-3492-A

		CAPACITOR, fixed: pF; ±5%; 500 V; unless otherwise stated
C101	21-82428B59	.01 uF +80-20%; 200 V
C102	23-84762H04	2.2 uF ±20%; 25 V
C103	21-82428B57	3300 ±10%; 200 V
C104, 105, 106	21-82428B59	.01 uF +80-20%; 200 V
C107L	21-82450B18	2
C107M	21-82450B19	1.8
C107H	21-82450B08	1.2
C107HH	21-82450B13	1.5
C108L	21-84426B10	75
C108M	21-83406D46	56; N150
C108H	21-83406D48	40; NP0
C108HH	21-83406D44	47; N80
C109L	21-84426B61	150
C109M	21-84426B32	105
C109H	21-84426B03	62
C109HH	21-84534B02	90
C110L	21-84426B61	150
C110M	21-84426B32	105
C110H, HH	21-84534B02	90
C111	21-84250B18	2
C112	21-82428B59	.01 uF +80-20%; 200 V
C113L	21-84426B06	100
C113M	21-83406D49	60; N150
C113H	21-83406D48	40; NP0
C113HH	21-83406D37	27; NP0
C114L, H	21-84426B15	220
C114M	21-84534B04	270
C114HH	21-84534B05	160
C115L	21-851846	8
C115M	21-82450B32	2.7
C115H	21-82450B13	1.5
C115HH	21-82450B08	1.2
C116L	21-84426B25	68
C116M	21-83406D50	51; N80
C116H	21-83406D40	36; NP0
C116HH	21-82133G46	24; NP0
C117L	21-82450B10	4.3
C117M	21-82450B19	1.8
C117H	21-82450B08	1.2
C117HH	21-82450B44	0.82
C118L	21-84426B10	75
C118M	21-83406D50	51; N80
C118H	21-83406D40	36; NP0
C118HH	21-82133G46	24; NP0
C119L	21-82450B32	2.7
C119M	21-82450B13	1.5
C119H	21-82450B08	1.2
C119HH	21-82450B48	0.75
C120L	21-84426B10	75
C120M	21-83406D50	51; N80
C120H	21-83406D40	36; NP0
C120HH	21-82133G46	24; NP0
C121L, M	21-82450B08	1.2
C121H, HH	21-82450B44	0.82
C122L	21-82133G62	22; N150
C122M	21-83406D57	13; NP0
C122H	21-83406D16	11; N150
C122HH	21-83406D02	5 ±25; N150
C123L, M	21-82428B57	3300 ±10%; 200 V
C123H, HH	21-82187B31	1500 ±10%; 100 V
C124	21-82428B59	.01 uF +80-20%; 200 V
C125L	21-84426B10	75
C125M	21-83406D50	51; N80
C125H	21-83406D43	39; NP0
C125HH	21-83406D42	43; NP0
C126	23-84762H04	2.2 uF ±20%; 25 V
C127L	21-84426B10	75
C127M	21-83406D46	56; N150
C127H	21-83406D48	40; NP0
C127HH	21-83406D50	51; N80
C128L	21-82450B17	2.2
C128M	21-82450B13	1.5
C128H, HH	21-82450B08	1.2
C129L, M, H	21-82428B57	3300 ±10%; 200 V
C129HH	21-82187B31	1500 ±10%; 100 V
C130	21-84426B18	130
C131	23-84762H04	2.2 uF ±20%; 25 V
C132	21-82428B59	.01 uF +80-20%; 200 V
C133	8-82905G04	.068 uF ±10%; 50 V
C134	23-84762H04	2.2 uF ±20%; 25 V
C135	21-82428B59	.01 uF +80-20%; 200 V
C136	21-82450B10	4.3
C137	21-84426B18	130
C138	21-82187B31	1500 ±10%; 100 V
C139	21-84426B21	80
C140, 141	21-82450B47	1.0
C142	21-84426B62	190
C143	21-84534B07	330
C144	8-82905G04	.068 uF ±10%; 50 V
C145	21-82428B59	.01 uF +80-20%; 200 V
C146	21-82372C04	.05 uF +80-20%; 25 V
C147		NOT USED
C148	21-82372C04	.05 uF +80-20%; 25 V
C149	8-83813H06	0.1 uF ±10%; 100 V
C150	21-82133G32	5.6 ±0.5 pF; NP0
C151	21-82450B48	0.75
C152	21-83406D57	13; NP0
C153	21-82133G19	15; NP0
C154	8-83813H06	0.1 uF ±10%; 100 V
C155	8-82905G04	.068 uF ±10%; 50 V
C156	23-83214C15	4.7 uF ±20%; 25 V
C157	21-82187B38	270 ±10%
C158	8-83813H06	0.1 uF ±10%; 100 V
C159	21-82187B27	2000 ±10%; 100 V
C160	8-82905H06	0.1 uF ±10%; 100 V
C161	21-82428B59	.01 uF +80-20%; 200 V
C162	21-82610C69	110; 200 V; N150
C163	21-84426B59	110
C164	21-82187B39	470 ±10%
C165	21-82428B59	.01 uF +80-20%; 200 V
C166	21-82187B39	470 ±10%
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR101	48-82139G01	germanium
CR102		NOT USED
CR103	48-82139G01	germanium
CR104, 105	48-84616A01	silicon; hot carrier
		LAMP, glow:
DS101	65-82267D02	neon; type NE-2
		INTEGRATED CIRCUIT: (SEE NOTE)
IC101, 102	51-84267A07	type M6707
		CONNECTOR, receptacle:
J101	9-84207B01	female; 7-contact
J102	9-84231B02	female; coaxial; miniature type
		COIL, RF:
L101	24-84115B03	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L102	24-84115B02	8-1/2 turns; coded RED; includes tuning core (coded YEL)
L103	24-84115B03	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L104L, M, H	24-84115B06	8-1/2 turns; tapped; coded BLU; includes tuning core (coded YEL)
L104HH	24-84115B13	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L105L, M, H	24-84113B03	7-1/2 turns; coded ORG; includes tuning core (coded YEL)
L105HH	24-84113B01	7-1/2 turns; coded BRN; includes tuning core (coded GRN)
L106L, M, H	24-84113B03	7-1/2 turns; coded ORG; includes tuning core (coded YEL)
L106HH	24-84113B01	7-1/2 turns; coded BRN; includes tuning core (coded GRN)
L107L, M, H	24-84113B03	7-1/2 turns; coded ORG; includes tuning core (coded YEL)
L107HH	24-84113B01	7-1/2 turns; coded BRN; includes tuning core (coded GRN)
L108	24-84113B03	7-1/2 turns; coded ORG; includes tuning core (coded YEL)
L109L, M	24-84114B03	12-1/2 turns; coded ORG; includes tuning core (coded YEL)
L109H, HH	24-84114B02	10-1/2 turns; coded RED; includes tuning core (coded YEL)
L110, 111	24-84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L112	24-84258B02	27 turns; tapped; coded RED; includes tuning core (coded RED)
L113	24-84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L114	24-84258B03	40 turns; coded ORG; includes tuning core (not coded)
L120, 121	24-83961B01	choke; ferrite bead type
L122L, M, H		NOT USED
L122HH	24-84270C01	choke; 0.30 uH
L123, 124	24-82135G10	choke; 100 uH
L125, 126	24-82835G26	choke; 71 uH
L127	24-82135G10	choke; 100 uH
L128	24-82135G01	choke; 620 uH
		TRANSISTOR: (SEE NOTE)
Q101	48-869494	NPN; type M9494 field-effect; N-channel; type M9651
Q102	48-869651	
Q103	48-869652	field-effect; N-channel; type M9652
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R101	6-129232	3.9k
R102	6-129886	27k ±5%
R103L, M	6-129819	3.9k ±5%
R103H, HH	6-124A60	3k ±5%
R104, 105	6-131274	47 ±5%
R106	6-131652	39
R107	6-129753	100
R108	6-129805	1k
R109L	6-131525	270 ±5%
R109M	6-129779	560 ±5%
R109H	6-129709	470 ±5%
R109HH	6-131524	100 ±5%
R110	6-129862	150
R111	6-131652	39
R112, 113	6-129236	15k ±5%
R114	6-124A23	82 ±5%
R115	6-129236	15k ±5%
R116	6-129707	2.7k ±5%
R117	6-129526	33k ±5%
R118	6-129777	39k ±5%
R119	6-129707	2.7k ±5%
R120	6-129818	820 ±5%
R121	6-129667	22k ±5%
R122	6-129804	2.2k ±5%
R123	6-129755	10
R124	6-129526	33k ±5%
R125	6-129886	27k ±5%
R126	6-131526	18k ±5%
R127	6-128684	56k ±5%
		THERMISTOR:
RT301	6-83841B04	3.15k ±10% @ 25°C; 0.5 W
		CRYSTAL UNIT, quartz:
Y101	48-84259B01	i-f filter
Y102	48-84269B02	i-f filter
Y103	48-84259B01	i-f filter
Y104, 105	48-84259B03	i-f filter
Y106	48-84104B01	discriminator

NOTE: For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part number.

TLB6960A Shifted IF Crystal Kit PL-2534-O

		CRYSTAL UNIT, quartz: 5.36 MHz:
Y101, Y103	48-84259B04	i-f filter
Y102	48-84259B05	i-f filter
Y104, Y105	48-84259B06	i-f filter
Y106	48-84104B02	discriminator filter

"MICOR" "SENSITRON" MID-BAND RECEIVER RF & IF BOARD

MODELS TLC6112A & TLC6112B

72-76 MHz

TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE		50 ohms
RF FREQUENCY RANGE		72-76 MHz
CHANNEL SPACING		20 kHz
SELECTIVITY EIA SINAD		-100 dB @ ±20 kHz
INTERMODULATION EIA SINAD		-80 dB
MODULATION ACCEPTANCE EIA		±7 kHz
SENSITIVITY	20 dB QUIETING	.5 microvolt or less
	EIA SINAD	.35 microvolt or less
OSCILLATOR (CHANNEL ELEMENT) STABILITY		Channel element maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference). Channel elements with frequency stability of ±.0002% are also available.
SPURIOUS & IMAGE REJECTION		-100 dB minimum (TLC6112A)
		-90 dB minimum (TLC6112B)
POWER REQUIREMENTS		Regulated 9.1 to 10.1 volts dc @ 70 mA. +13.8 volts dc @ 12 mA.
CONSTRUCTION		Fully solid-state, two integrated circuits
RECEIVER TYPE		FM, superheterodyne, single conversion
INTERMEDIATE FREQUENCY		5.26 MHz
CRYSTAL FILTER TYPE		Dual resonator, mode coupled, monolithic crystals
METERING		Three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set or any 50 microampere meter with 2,000 ohms equivalent series resistance. Built-in service metering also available.

1. DESCRIPTION

1.1 This fully solid-state receiver rf and i-f circuit board incorporates two integrated circuits, two i-f crystal filters, three transistors, plug-in channel elements, and a crystal discriminator.

1.2 All circuits are constructed on a single plug-in circuit board which is easily removed and replaced. All external dc and audio connections are made at a single row of pins which eliminate interconnecting wires; rf input is provided by a single plug-in coaxial cable. Circuit board plating is on both sides of the board with all components mounted on the back side. All alignment points are accessible from the front of the station.

1.3 This board produces a low-noise audio signal from an "on-channel" frequency modulated rf carrier.

2. CIRCUIT ANALYSIS

This receiver board is a highly selective, crystal-controlled, single conversion FM receiver

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

68P81026E36-D
6/12/81- UP

(less audio amplifier, squelch circuitry and speaker). Bandwidth and selectivity characteristics are determined by rf preselector coils and i-f crystal filters. Plug-in crystal oscillator modules (channel elements) provide stable frequency control. Highly reliable integrated circuits are used for all i-f amplification and limiting after the first crystal filter section. A crystal discriminator is used to provide high audio recovery from the i-f signal. Refer to schematic diagram for more circuit details.

3. MAINTENANCE

This section of the manual provides the maintenance procedures for the receiver rf and i-f section of the station. These tests include metering measurements and procedures for testing and troubleshooting, including integrated circuit check-out.

NOTE

The receiver rf and i-f board must be installed in the receiver for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation and testing to provide a good rf ground to all stations of the receiver.

3.1 20 dB QUIETING SENSITIVITY TEST

3.1.1 This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service.

3.1.2 It may be performed using optional built-in receiver metering or a Motorola S-1056B thru S-1059B Series Portable Test Set. J101 can accommodate only the built-in metering set or the portable test set, but not both simultaneously. Plugging a portable test set in a receiver that has built-in metering will disconnect the built-in metering cable.

NOTE

The receiver shield must be in place while performing this test.

Step 1. Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" receivers must also be PL disabled.

Step 2. (Optional built-in receiver metering only.) Set the meter selector switch to position 6 and the speaker switch to the OFF position. Adjust the LINE LEVEL control for 50 uA as indicated on the meter.

Step 3. (Portable test set only.) If a portable test set is used, an ac voltmeter is required. Connect an ac voltmeter across pins 1 and 18 of the audio control module. Adjust the line level control so the ac voltmeter reads 565 mV ac.

Step 4. Connect a signal generator to the station antenna receptacle and adjust it to the receiver frequency. Set the rf output to minimum.

Step 5. Increase the signal generator output until the meter reading drops to 1/10 of the value in step 2 or step 3. The generator output level now indicates the 20 dB quieting sensitivity and should be .35 microvolt, or less.

Step 6. Readjust the LINE LEVEL pot as described in the MAINTENANCE section in the front of the manual.

3.2 TROUBLESHOOTING

3.2.1 Circuit Measurements

3.2.1.1 General

3.2.1.1.1 A failure in almost any part of the rf and i-f section will produce an improper meter reading on one or more of the test points. Improper alignment will also cause improper meter readings.

3.2.1.1.2 A "0" meter reading in position 3 or 5 indicates either (1) insufficient drive from a preceding stage or (2) a defective component at the metering point.

3.2.1.2 Procedure

Step 1. (Portable test set only.) Connect the 20-pin plug of the adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve test set battery life. The plug acts as an on-off switch completing the battery circuit.

Step 2. (Portable test set only.) Connect the white "metering" plug of the adapter cable to the metering receptacle on the receiver rf and i-f circuit board.

Step 3. Compare the current readings in SELECTOR SWITCH positions 3, 4 and 5 with

those in the following table. A low reading on meter position 3 indicates a defective channel element or multiplier circuit. An improper meter reading in position 4 or 5 readings indicate a malfunction elsewhere in the receiver, which can most rapidly be found by checking rf and i-f voltages, per the schematic diagram.

3.2.2 Alignment as a Troubleshooting Aid

Low test set readings, improper discriminator output, and otherwise abnormal performance are very often corrected by realignment. Therefore, alignment should be the first step performed for these symptoms. Many technicians prefer to use alignment as the first troubleshooting step in all cases.

TYPICAL RECEIVER RF & IF METER READINGS TABLE (NO INPUT SIGNAL APPLIED)

SELECTOR SWITCH POSITION	METER READING (uA)	CIRCUIT METERED
3	25 min.	Channel element output (TLC6112A)
	18 min.	Channel element output (TLC6112B)
4	0 ±2	Discriminator output
5	2 to 10	3rd i-f amplifier and limiter

3.2.3 Isolating Defective Components

If test set readings are abnormal or other tests indicate abnormal performance, a troubleshooting procedure is desirable to isolate the defective component. The troubleshooting chart summarizes troubleshooting in a logical sequence. Normal rf voltages through the receiver are shown on the schematic diagram. These voltage readings are typical and can vary as much as 2 to 1 in a normal receiver because of an accumulation of small differences in gain or insertion loss of preceding circuitry. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component.

3.2.4 Troubleshooting Integrated Circuits

3.2.4.1 The IC's in the receiver i-f section may be checked by dc voltage measurements. Proper voltages are shown on the schematic diagram and in the tables that accompany the schematic diagram.

3.2.4.2 For several of the dc voltages the absolute value is not so important as is the relationship of one voltage to another. These relationships are clearly shown on the schematic diagram and the accompanying tables.

NOTE

To measure dc voltages on IC102, the discriminator shield (solder side of board) must be removed. This cover must be replaced to take meter and gain measurements after repairs have been completed.

3.2.5 Troubleshooting Crystals

3.2.5.1 A defective filter can best be found by measuring the rf voltages at the various points in the i-f section as indicated in the schematic diagram and receiver RF Voltage Table. A defective crystal will show an abnormally high insertion loss. Before making the check, verify, using an ohmmeter, that the center pins of all five filter crystals are connected to the associated crystal case. The resistance between the center pin and the case should be less than 1 ohm. The loss of this ground may cause errors in gain measurements because of the loss of shielding effectiveness.

3.2.5.2 Before replacing the discriminator crystal, verify that all components associated with the discriminator circuitry are not defective. Also, verify, in a manner similar to that used for the filter crystals, that pin 2 is connected (less than 0.1 ohm) to the crystal case.

NOTE

When discriminator or filter crystals are replaced (except for Y102), they must be physically oriented so that the index asterisk on the top of the filter can is as shown on the schematic diagram or circuit board detail. The crystals are built to match specific input and output impedances and will not perform satisfactorily if reversed. Y102, if replaced, may be oriented in either direction.

A. FREQUENCY

T PROCEDURE (Cont'd.)

$$f_o = \frac{f_c + 5}{g}$$

Where:

f_o = channe

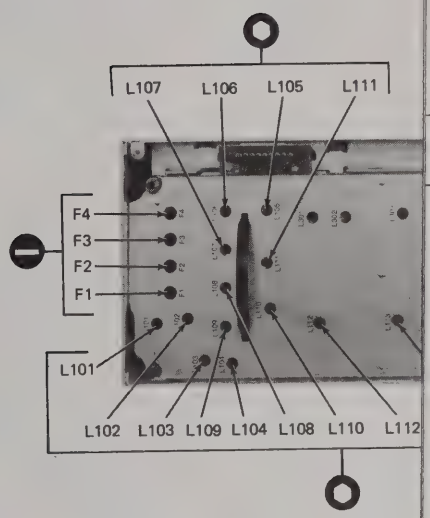
f_c = rf car

6 = channe

5.26 = mixer

	Osc. & Meter Rev.	Stage and Procedure
	METER REV.	INJECTION AMPLIFIER OUTPUT -- Adjust L103, L104, L109, and L110 for a peak on meter position 5. Repeat.
	METER REV.	ON-FREQUENCY ADJUSTMENT -- Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, meter 5 should indicate a rise when transmitter is keyed (if necessary, connect an antenna to the station). Check position 4 reading with transmitter keyed. A "0" indicates an on-frequency condition. Adjust F1 receiver warp capacitor for exact 0 reading. DO NOT RE-ADJUST L101 OR L102 AFTER THESE ADJUSTMENTS ARE MADE.
	--	Perform 20 dB quieting sensitivity measurement as check of alignment.

B. ADJUSTM



C. TYPICAL RECEIV

(NO SIG

METER SWITCH POSITION	REAI
3	18
	18
4	0
5	2

A. FREQUENCY CALCULATIONS

$$f_o = \frac{f_c + 5.26\ \text{MHz}}{6}$$

Where:

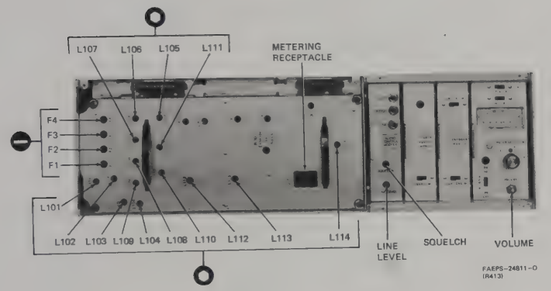
f_o = channel element frequency

f_c = rf carrier frequency

6 = channel element harmonic

5.26 = mixer output frequency (i-f)

B. ADJUSTMENT LOCATIONS



C. TYPICAL RECEIVER METER READINGS

(NO SIGNAL INPUT)

METER SWITCH POSITION	READING (uA)	CIRCUIT METERED
3	18 min.	Channel Element Output (TLC6112A)
	18 min.	Channel Element Output (TLC6112B)
4	0 ±2	Discriminator Output
5	2 to 10	3rd IF Amplifier and Limiter

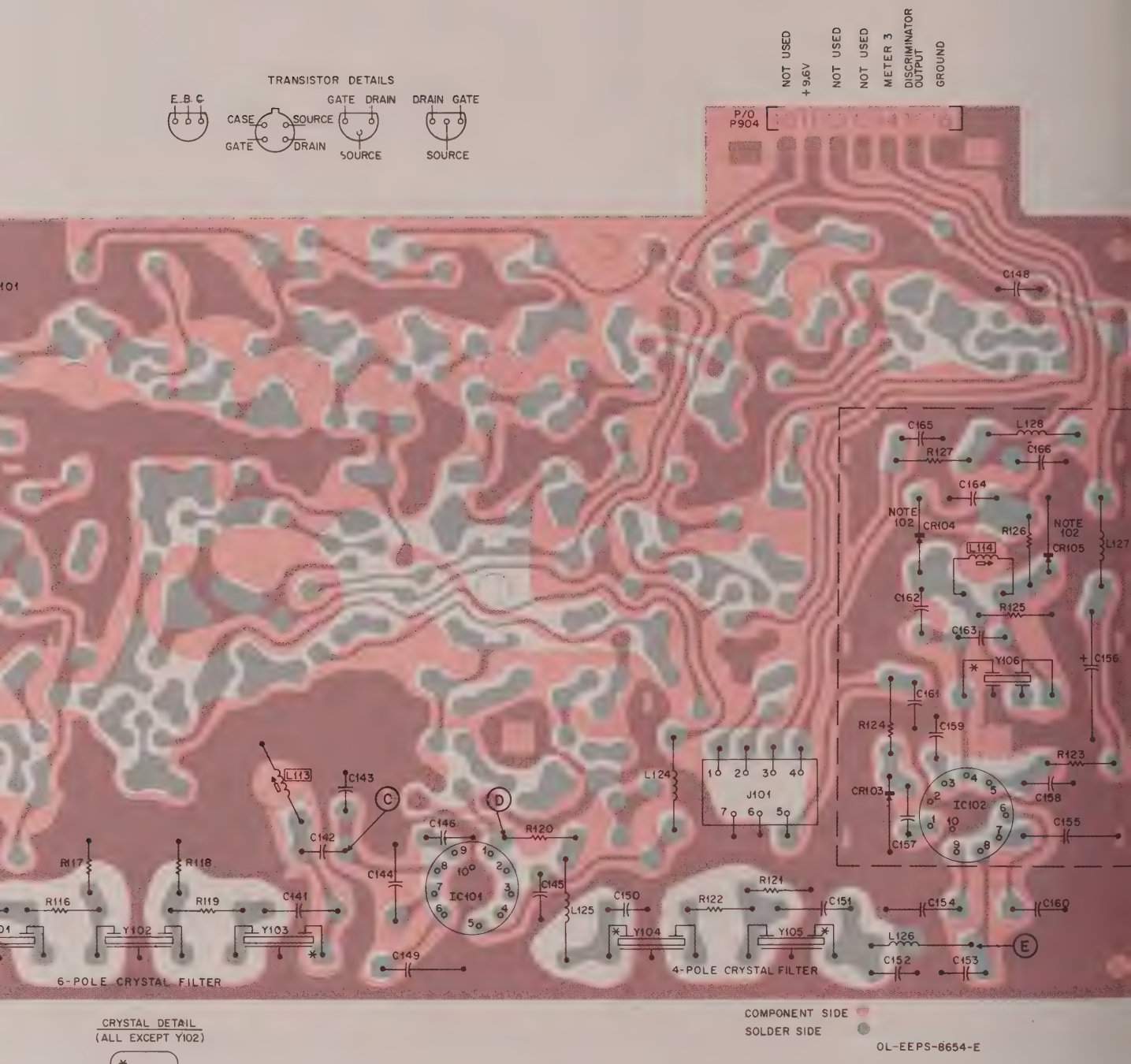
D. ALIGNMENT PROCEDURE

Step	Adjust	Selector Switch Position: Portable Test Set	Selector Switch Position: Optional Built-In Receiver Metering	Osc. & Meter Rev.	Stage and Procedure
1	L101, L102	3	3	METER REV.	CHANNEL ELEMENT OUTPUT -- If coils have been completely misaligned or the frequency is being changed, pre-position the coil slugs flush with the board. Adjust L101 and L102 for a peak indication on meter 3.
2	L103, L104	3	3	METER REV.	INJECTION AMPLIFIER OUTPUT -- Adjust L103 for a dip and L104 for a peak on meter position 3. Repeat alignment procedure step 1.
3		*	6	A or B (Test Set must be equipped with 5.26 MHz crystal in corresponding socket)	DISCRIMINATOR -- Unsquelch the receiver by turning the squelch control fully counterclockwise. "Private-Line" stations must also be PL disabled. Note meter reading. Insert 5.26 MHz ±100 Hz signal (from portable test set, or similar high accuracy generator) into L113 opening of receiver shield being careful not to contact circuit board. Insert probe into hole far enough to obtain reading lower than 1/10 of that noted at beginning of this step (signal is "sprayed" into radio).
	L114	4	4		Adjust L114 for 0 center reading. Adjustment is critical and should be exactly on 0. Remove probe.
4	L110, L111, L112, L113	5	5	METER REV.	INTERMEDIATE FREQUENCY -- If the i-f has been completely misaligned, pre-position slugs approximately 1/4 inch from the board, otherwise, proceed as follows. Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal sufficient for an indication of about 20 microamperes on meter position 5. Peak L110 thru L113. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 microamperes. Repeat.
5	L105, L106, L107, L108, L109	5	5	METER REV.	RF PRESELECTOR -- If the preselector has been completely misaligned or the frequency is being changed, pre-position the slugs to the bottom of the preselector cans (flush with the board). Connect a signal generator to the antenna input and apply and carefully maintain an on-frequency signal sufficient for an indication of about 20 microamperes on meter 5. Peak L105 thru L109. Lower signal generator output level while peaking these coils to maintain a meter 5 indication between 20 and 30 microamperes. Repeat.

*If the portable test set is used, connect an ac voltmeter across pins 1 and 18 of the audio control module for this reading.

D. ALIGNMENT PROCEDURE (Cont'd.)

Step	Adjust	Selector Switch Position: Portable Test Set	Selector Switch Position: Optional Built-In Receiver Metering	Osc. & Meter Rev.	Stage and Procedure
6	L103, L104, L109, L110	5	5	METER REV.	INJECTION AMPLIFIER OUTPUT -- Adjust L103, L104, L109, and L110 for a peak on meter position 5. Repeat.
7	F1	5	5	METER REV.	ON-FREQUENCY ADJUSTMENT -- Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, meter 5 should indicate a rise when transmitter is keyed (if necessary, connect an antenna to the station). Check position 4 reading with transmitter keyed. A "0" indicates an on-frequency condition. Adjust F1 receiver warp capacitor for exact 0 reading. DO NOT RE-ADJUST L101 OR L102 AFTER THESE ADJUSTMENTS ARE MADE.
8	--	--	--	--	Perform 20 dB quieting sensitivity measurement as check of alignment.



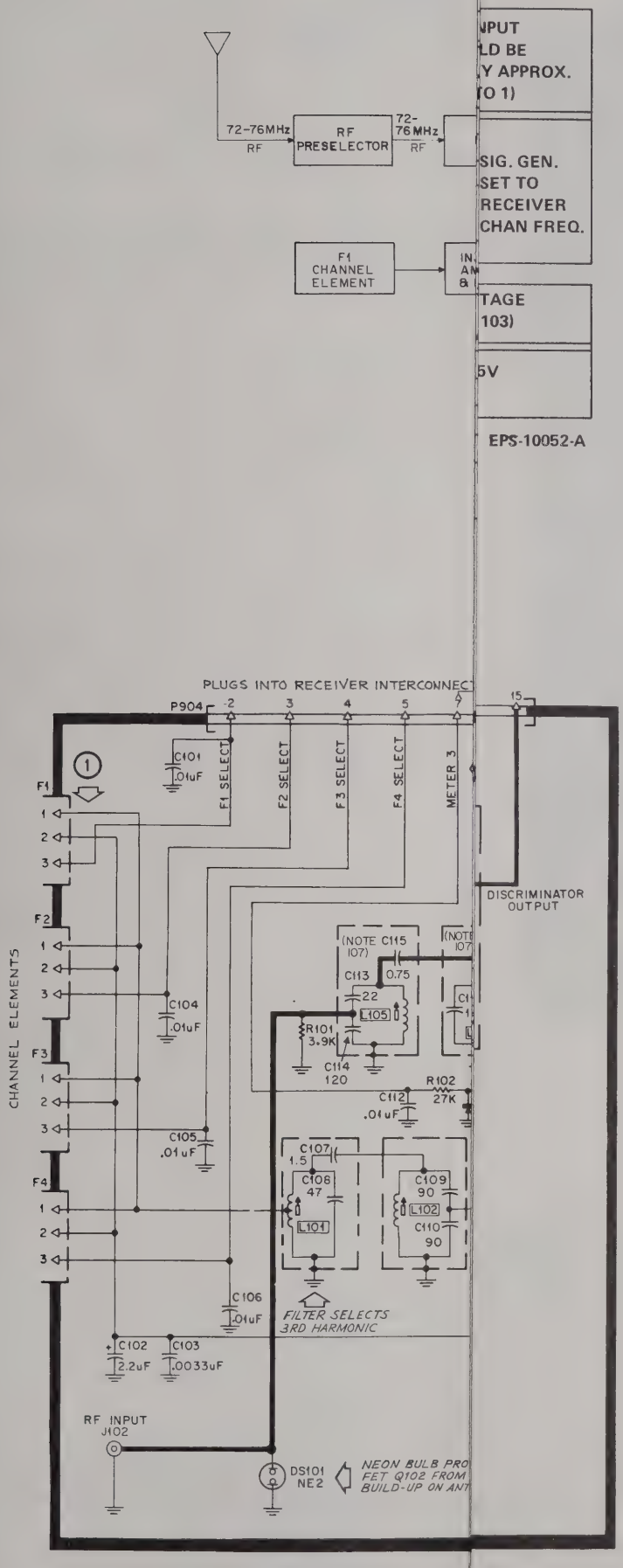
CRYSTAL DETAIL
(ALL EXCEPT Y102)

*

IMPORTANT – ORIENT INDEX * ON TOP OF CAN AS SHOWN ON CIRCUIT BOARD DETAIL

COMPONENT SIDE
SOLDER SIDE

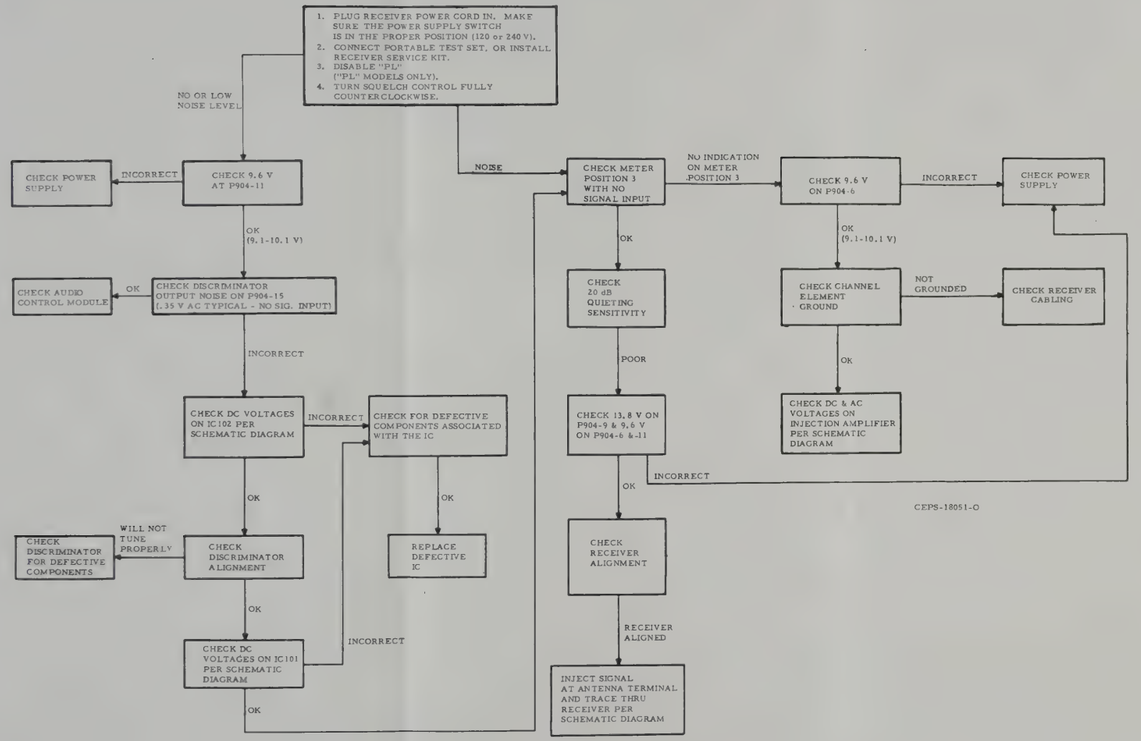
OL-EEPS-8654-E

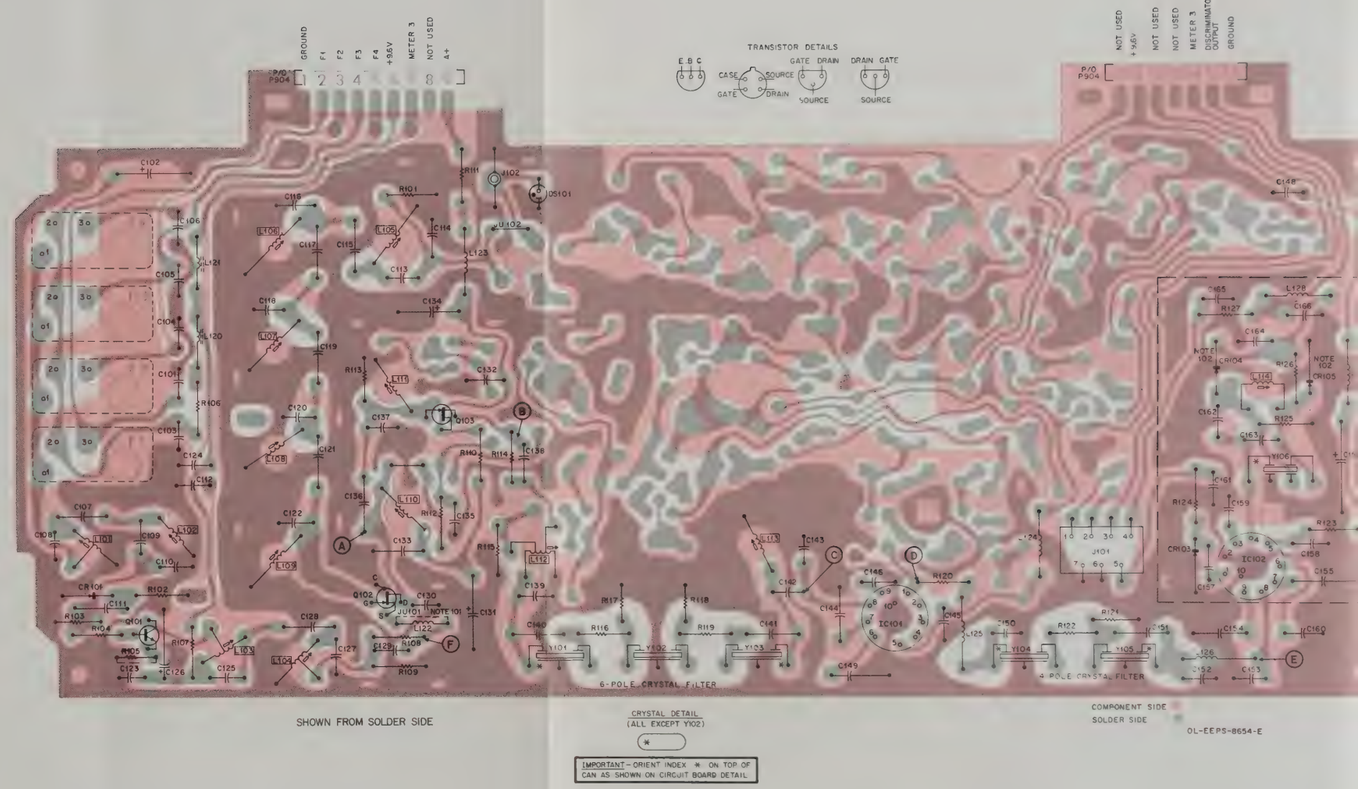


PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

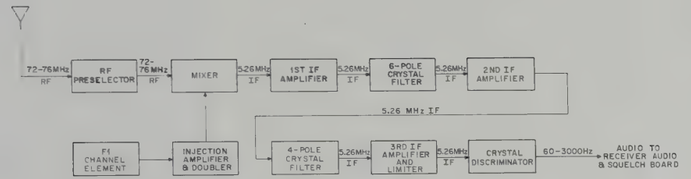
Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17908-C
7/15/81- UP

TROUBLESHOOTING CHART


1. PLUG RECEIVER POWER CORD IN, MAKE SURE THE POWER SUPPLY SWITCH IS IN THE PROPER POSITION (120 or 240 V).
2. CONNECT PORTABLE TEST SET, OR INSTALL RECEIVER SERVICE KIT.
3. DISABLE "PL" ("PL" MODELS ONLY).
4. TURN SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
NO OR LOW NOISE LEVEL
NOISE
CHECK POWER SUPPLY
INCORRECT
CHECK 9.6 V AT P904-11
OK (9.1-10.1 V)
CHECK AUDIO CONTROL MODULE
OK
CHECK DISCRIMINATOR OUTPUT NOISE ON P904-15 (.35 V AC TYPICAL - NO SIG. INPUT)
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
INCORRECT
CHECK FOR DEFECTIVE COMPONENTS ASSOCIATED WITH THE IC
OK
CHECK DISCRIMINATOR FOR DEFECTIVE COMPONENTS
WILL NOT TUNE PROPERLY
CHECK DISCRIMINATOR ALIGNMENT
OK
REPLACE DEFECTIVE IC
OK
CHECK DC VOLTAGES ON IC101 PER SCHEMATIC DIAGRAM
INCORRECT
OK
CHECK METER POSITION 3 WITH NO SIGNAL INPUT
NO INDICATION ON METER POSITION 3
CHECK 9.6 V ON P904-6
INCORRECT
CHECK POWER SUPPLY
OK (9.1-10.1 V)
OK
CHECK QUIETING SENSITIVITY
NOT GROUNDED
CHECK RECEIVER CABLING
POOR
CHECK 13.8 V ON P904-9 & 9.6 V ON P904-6 &-11
CHECK CHANNEL ELEMENT GROUND
OK
CHECK DC & AC VOLTAGES ON INJECTION AMPLIFIER PER SCHEMATIC DIAGRAM
INCORRECT
OK
CHECK RECEIVER ALIGNMENT
RECEIVER ALIGNED
INJECT SIGNAL AT ANTENNA TERMINAL AND TRACE THRU RECEIVER PER SCHEMATIC DIAGRAM
CEPS-18051-O



Receiver Circuit Board Detail and Troubleshooting Chart
Motorola No. PEPS-17906-B
7/15/81- UP



69C81018E34-A

DC VOLTAGE TABLE FOR IC'S

PIN	VOLTAGE
	IC101
1	3.0V (SLIGHTLY HIGHER THAN PINS 8 AND 9)
5	9.5V (VARIES WITH 9.6V LINE)
6	7.2V
7	6.4V
8	2.9V (PINS 8 AND 9 MUST BE EQUAL)
9	
	IC102
1	3.0V (PINS 1 AND 3 MUST BE EQUAL AND SLIGHLY HIGHER THAN PINS 8 AND 9. PIN 1 MUST BE BY-PASSED TO GND WITH .01 uF CAP. WHEN MEASURED.)
3	
4	6.3V (3.0V LOWER THAN PIN 5)
5	9.3V (VARIES WITH 9.6V LINE)
6	7.2V
7	6.4V
8	2.9V (PINS 8 AND 9 MUST BE EQUAL)
9	

EPS-10051-O

RECEIVER RF & IF BOARD

101. RECEIVER FREQUENCY CALCULATIONS: SEE ALIGNMENT PROCEDURE.
102. DASHED LINES REPRESENT SHIELDING.
103. RF MEASUREMENTS TAKEN WITH MOTOROLA SOLID-STATE DC MULTIMETER WITH PLUG-IN RF PROBE.
104. UNLESS OTHERWISE STATED: DC VOLTAGES GIVEN ARE NOMINAL AND MAY VARY ±25 PER CENT. DC VOLTAGES ARE MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER WITH RESPECT TO CHASSIS GROUND.
105. INDEX ASTERISK ON CRYSTAL CAN INDICATES PHYSICAL ORIENTATION.
106. VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.
107. USED IN MODEL TLC6112B ONLY.
108. R105 IS USED IN MODEL TLC6112A ONLY.

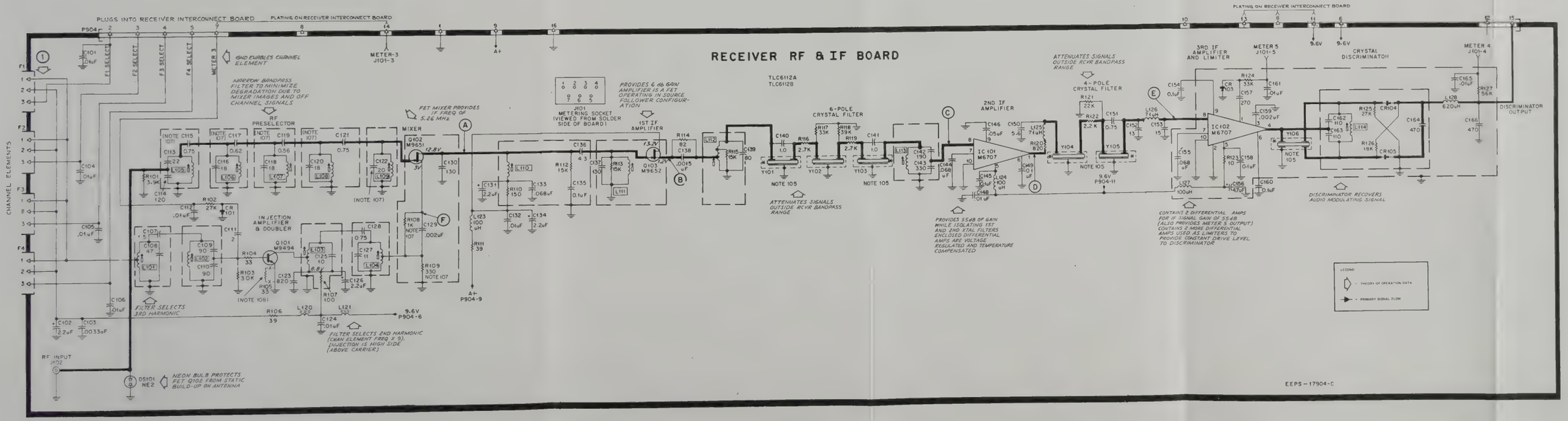
EPS-10050-A

RF VOLTAGE TABLE

SET RF INPUT AT ANT. TO OBTAIN (NOTE 103)	AT TEST POINT	RF INPUT SHOULD BE (MAY VARY APPROX. 2 TO 1)	
0.5V	A	8.0 mV	SIG. GEN. SET TO RECEIVER CHAN FREQ.
100 mV	B	6.0 mV	
	C	5.0 mV	
	D	10.0 uV	
	E	20.0 uV	

TEST POINT	RANGE	RF VOLTAGE (NOTE 103)
F	72-76 MHZ	0.9-1.5V

EPS-10052-A


RECEIVER RF & IF BOARD
TLC6112A
TLC6112B
PLUGS INTO RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
P904
CHANNEL ELEMENTS
F1 SELECT
F2 SELECT
F3 SELECT
F4 SELECT
METER 3
GND ENABLES CHANNEL ELEMENT
METER-3 J101-3
A+
9.6V
NARROW BANDPASS FILTER TO MINIMIZE DEGRADATION DUE TO MIXER IMAGES AND OFF CHANNEL SIGNALS
RF PRESELECTOR
MIXER
FET MIXER PROVIDES IF FREQ OF 5.26 MHz
J101 METERING SOCKET (VIEWED FROM SOLDER SIDE OF BOARD)
PROVIDES 6 db GAIN AMPLIFIER IS A FET OPERATING IN SOURCE FOLLOWER CONFIGURATION
1ST IF AMPLIFIER
6-POLE CRYSTAL FILTER
ATTENUATES SIGNALS OUTSIDE RCVR BANDPASS RANGE
2ND IF AMPLIFIER
4-POLE CRYSTAL FILTER
ATTENUATES SIGNALS OUTSIDE RCVR BANDPASS RANGE.
3RD IF AMPLIFIER AND LIMITER
METER 5 J101-5
CRYSTAL DISCRIMINATOR
METER 4 J101-4
DISCRIMINATOR OUTPUT
INJECTION AMPLIFIER & DOUBLER
FILTER SELECTS 3RD HARMONIC
FILTER SELECTS 2ND HARMONIC (CHAN ELEMENT FREQ X 3). INJECTION IS HIGH SIDE (ABOVE CARRIER)
RF INPUT J102
NEON BULB PROTECTS FET Q102 FROM STATIC BUILD-UP ON ANTENNA
PROVIDES 55dB OF GAIN WHILE ISOLATING 1ST AND 2ND XTAL FILTERS. ENCLOSED DIFFERENTIAL AMPS ARE VOLTAGE REGULATED AND TEMPERATURE COMPENSATED
CONTAINS 2 DIFFERENTIAL AMPS FOR IF SIGNAL GAIN OF 55dB (ALSO PROVIDES METER 5 OUTPUT) CONTAINS 2 MORE DIFFERENTIAL AMPS USED AS LIMITERS TO PROVIDE CONSTANT DRIVE LEVEL TO DISCRIMINATOR
DISCRIMINATOR RECOVERS AUDIO MODULATING SIGNAL
LEGEND
= THEORY OF OPERATION DATA
= PRIMARY SIGNAL FLOW
EEPS-17904-C

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM
Receiver RF & I-F
Schematic and Block Diagrams
Motorola No. PEPS-17908-C
7/15/81- UP

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLC6112A & TLC6112B Receiver RF & IF Board (72-76 MHz) PL-2078-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF: ±5%; 500 V: unless otherwise stated
C101	21D82428B59	.01 uF +80-20%; 200 V
C102	23D84762H04	2.2 uF ±20%; 25 V
C103	21D82428B57	3300 ±10%; 200 V
C104, 105, 106	21D82428B59	.01 uF +80-20%; 200 V
C107	21D82450B13	1.5; coded BRN-GRN-WHT-GOLD
C108	21D83406D44	47; N80
C109, 110	21D84534B02	90
C111	21D82450B18	2; coded RED-BLK-WHT-GOLD
C112	21D82428B59	.01 uF +80-20%; 200 V
C113	21-124554	22; NP0
C114	21-840713	120
C115	21D82450B16	0.62 ±10%; coded BLU-RED-GRAY-SILVER (TLC6112A)
C115	21D82450B48	0.75; coded VIO-GRN-GRY-GOLD (TLC6112B)
C116	21-122235	18; NP0
C117	21D82450B33	0.56; coded GRN-BLU-GRAY-GOLD (TLC6112A)
C117	21D82450B46	0.62; coded BLU-RED-GRY-GOLD (TLC6112B)
C118	21-122235	18; NP0
C119	21D82450B29	0.51; coded GRN-BLU-GRAY-GOLD (TLC6112A)
C119	21D82450B29	0.56; coded GRN-BLU-GRY-GOLD (TLC6112B)
C120	21-122235	18; NP0
C121	21D82450B33	0.56; coded GRN-BLU-GRAY-GOLD (TLC6112A)
C121	21D82450B48	0.75; coded VIO-GRN-GRY-GOLD (TLC6112B)
C122	21-82133G01	10; NP0 (TLC6112A)
C122	21-82610C22	20; NP0 (TLC6112B)
C123	21D82187B17	820 ±10%
C124	21D82428B59	.01 uF +80-20%; 200 V
C125	21-82133G01	10; NP0
C126	23D84762H04	2.2 uF ±20%; 25 V
C127	21-851845	11; NP0
C128	21D82450B48	0.75; coded VIO-GRN-GRAY-GOLD
C129	21-82428B28	.002 uF ±10%; 100 V
C130	21D84426B18	130
C131	23D84762H04	2.2 uF ±20%; 25 V
C132	21D82428B59	.01 uF +80-20%; 200 V
C133	8D82905G04	.068 uF ±10%; 50 V
C134	23D84762H04	2.2 uF ±20%; 25 V
C135	21D82428B59	.01 uF +80-20%; 200 V
C136	21D82450B10	4.3; coded YEL-ORG-WHT-GOLD
C137	21D84426B18	130
C138	21D82187B31	1500 ±10%; 100 V
C139	21D84426B21	80
C140, 141	21D82450B47	1.0; coded BRN-BLK-WHT-GOLD
C142	21D84426B62	190
C143	21D84534B07	330
C144	8D82905G04	.068 uF ±10%; 50 V
C145	21D82428B59	.01 uF +80-20%; 200 V
C146	21C82372C04	.05 uF +80-20%; 25 V
C148	21-82428B59	.01 uF +80-20%; 200 V
C149	8D83813H06	0.1 uF ±10%; 100 V
C150	21D82133G32	5.6 ±0.5 pF; NP0
C151	21D82450B48	0.75; coded VIO-GRN-GRAY-GOLD
C152	21D83406D57	13; NP0
C153	21D82133G19	15; NP0
C154	8D83813H06	0.1 uF ±10%; 100 V
C155	8D82905G04	.068 uF ±10%; 500 V
C156	23D83214C15	4.7 uF ±20%; 25 V
C157	21D82187B38	270 ±10%
C158	8D83813H06	0.1 uF ±10%; 100 V
C159	21D82187B27	2000 ±10%; 100 V
C160	8-83813H06	0.1 uF ±10%; 100 V
C161	21D82428B59	.01 uF +80-20%; 200 V
C162	21D82610C69	110; 200 V; N150
C163	21D84426B59	110
C164	21D82187B39	470 ±10%
C165	21D82428B59	.01 uF +80-20%; 200 V
C166	21D82187B39	470 ±10%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode:
CR101	48D82139G01	germanium
CR103	48D82139G01	germanium
CR104	48D84616A01	silicon; hot-carrier
CR105	48D84616A01	silicon; hot-carrier
		LAMP, glow:
DS101	65B82267D02	neon; type NE-2
		INTEGRATED CIRCUIT:
IC101	51-84561L69	type M6707
IC102	51-84561L69	type M6707
		CONNECTOR, receptacle:
J101	9C84207B01	female; 7-contact
J102	9C84231B02	female; coaxial; miniature type
		COIL, RF:
L101	24D84115B03	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L102	24D84115B02	8-1/2 turns; coded RED; includes tuning core (coded YEL)
L103	24D84115B03	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L104	24D84115B13	8-1/2 turns; tapped; coded ORG; includes tuning core (coded YEL)
L105 thru L108	24D84113B07	4-1/2 turns; coded GRN; includes tuning core (coded ORG)
L109	24D84114B05	3-1/2 turns; coded BLUE; includes tuning core coded ORG (TLC6112B)
L109	24D84114B04	4-1/2 turns; coded YEL; includes tuning core coded ORG (TLC6112A)
L110, 111	24D84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L112	24D84258B02	27 turns; tapped; coded RED; includes tuning core (coded RED)
L113	24D84258B01	21 turns; coded BRN; includes tuning core (coded RED)
L114	24D84258B03	40 turns; coded ORG; includes tuning core (note coded)
L120, 121	24C83961B01	choke; ferrite bead type
L123, 124	24D82135G10	choke; 100 uH
L125, 126	24D82835G26	choke; 71 uH
L127	24D82135G10	choke; 100 uH
L128	24D82135G01	choke; 620 uH
		TRANSISTOR:
Q101	48R869494	N-P-N; type M9494
Q102	48R869651	field-effect; N-channel type M9651
Q103	48R869652	field-effect; N-channel type M9652
		RESISTOR, fixed: ±5%; 1/4 W: unl. stated
R101	6S129232	3.9k ±10%
R102	6S127806	27k ±10%
R103	6S124A60	3k
R104	6-124A13	33
R105	6-124A13	33 (TLC6112A only)
R106	6S131652	39 ±10%
R107	6S129753	100 ±10%
R108	6-124A59	2.7k (TLC6112A)
R108	6-124A49	1k (TLC6112B)
R109	6-124A27	120 (TLC6112A)
R109	6-129806	330 (TLC6112B)
R110	6S129862	150 ±10%
R111	6S131652	39 ±10%
R112	6S129236	15k
R113	6S129236	15k
R114	6S124A23	82
R115	6S129236	15k
R116	6S129707	2.7k
R117	6S129526	33k
R118	6S128777	39k
R119	6S129707	2.7k
R120	6S129818	820
R121	6S129667	22k
R122	6S129804	2.2k
R123	6S129755	10 ±10%
R124	6S129526	33k
R125	6S129886	27k
R126	6S131526	18k
R127	6S128684	56k ±10%
		CRYSTAL UNIT, quartz:
Y101	48D84259B01	i-f filter
Y102	48D84259B02	i-f filter
Y103	48D84259B01	i-f filter
Y104	48D84259B03	i-f filter
Y105	48D84259B03	i-f filter
Y106	48D84104B01	discriminator

"MICOR" "SENSITRON" HIGH BAND RECEIVER RF & IF BOARD

TLD8270B SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TLD8271B	132-142
TLD8272B	142-150.8
TLD8273B	150.8-162
TLD8274B	162-174

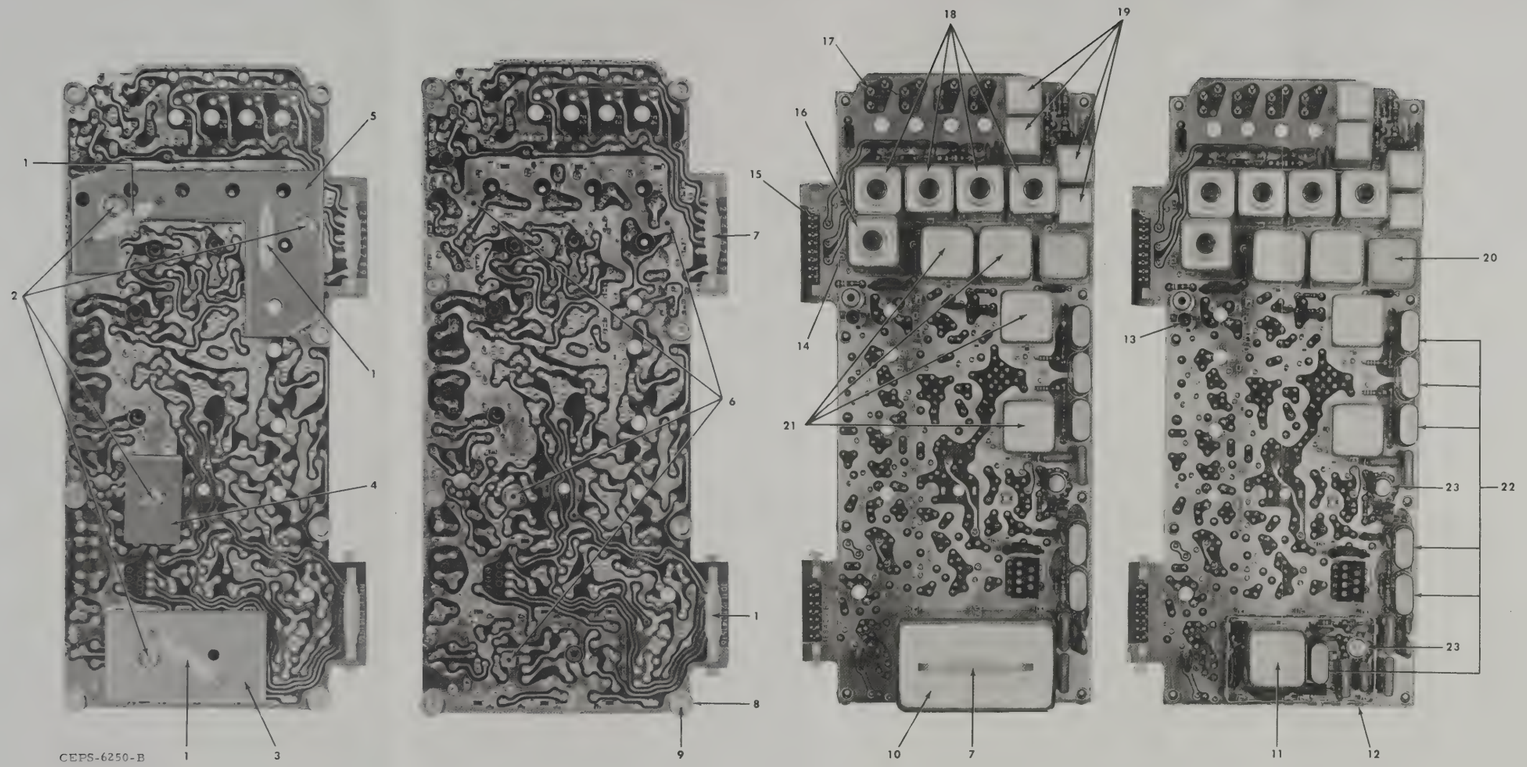
TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE		50 ohms
RF FREQUENCY RANGE		132-174 MHz
CHANNEL ELEMENT FREQUENCY RANGE		15.455-18.055 MHz
CHANNEL SPACING		30 kHz
NUMBER OF CHANNELS		1 (capable of up to 4 for special applications)
SELECTIVITY EIA SINAD		-100 dB @±30 kHz
INTERMODULATION EIA SINAD		-80 dB
MODULATION ACCEPTANCE EIA		±7 kHz
SENSITIVITY (50 OHMS RF INPUT IMPEDANCE)	20 dB Quieting	less than 0.5 microvolt
	EIA Sinad	less than 0.35 microvolt
OSCILLATOR (CHANNEL ELEMENT) STABILITY		±.0005% (AFC optional) from -30°C to +60° C ambient
SPURIOUS & IMAGE REJECTION		-100 dB
POWER REQUIREMENTS		regulated 9.6 volts @ 70 mA 13.8 volts @ 20 mA
CONSTRUCTION		fully solid-state, two integrated circuits
RECEIVER TYPE		FM superheterodyne single conversion
IF FREQUENCY		11.7 MHz or 11.8 MHz
CRYSTAL FILTER TYPE		dual resonator, mode coupled, monolithic crystal
DISCRIMINATOR TYPE		dual resonator, mode coupled, monolithic crystal
METERING		three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set, optional built-in metering, or any 50 microampere meter.

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

68P81026E37-K
6/12/81- UP



REVISIONS 68P81026E36-D

CHASSIS & SUFFIX NO.	REF SYMBOL	CHANGE	POSITION
TLC6112A & TLC6112B	102	FROM 51-84267A07 TO 51-84561L69	2YD & 2PD I-F AMPLIFIER

PARTS LIST

Mechanical Parts List for
TLB6850A & TLC6110A Series

PL-936-B

CODE	MOTOROLA PART NO.	DESCRIPTION
1	55B84300B03	HANDLE
2	3S134212	LOCKSCREW, tapping: No. 4-40 x 5/16" "Phillips" hex head
3	26B84242B01	SHIELD
4	26B84244B01	SHIELD
5	26C84689B01	SHIELD
6	5B84220B01	GROMMET, "nylon"
7	55B84300B02	HANDLE
8	42C82484B01	RETAINER, screw (8 req'd)
9	3S136905	LOCKSCREW, tapping: No. 4-40 x 5/16" "Phillips" round head (8 req'd)
10	26B84253B01	SHIELD
11	26B84250B04	CAN, square (staked)
12	26C83838F01	SPRING, retainer
13	7B84264B01	BRACKET, lamp holder
14	29S10434AZ9	RECEPTACLE, female (ZZ req'd)
15	29C84028H01	TERMINAL, male
16	26B84248B02	CAN, square (staked)
17	29K855943	TERMINAL, pin; male
18	26B84248B02	CAN, square (staked)
19	26B84250B03	CAN, square (staked)
20	26B84250B01	CAN, square (staked)
21	26B84250B02	CAN, square (staked)
22	14A84503B01	INSULATOR, crystal
23	4A49854	WASHER, spacer

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLC6112A & TLC6112B Receiver RF & IF Board (72-76 MHz)

PL-2078-D

		CAPACITOR, fixed: pF: ±5%; 500 V: unless otherwise stated
C101	21D82428B59	.01 uF +80-20%: 200 V
C102	23D84762H04	2.2 uF ±20%: 25 V
C103	21D82428B57	3300 ±10%: 200 V
C104, 105, 106	21D82428B59	.01 uF +80-20%: 200 V
C107	21D82450B13	1.5: coded BRN-GRN-WHT-GOLD
C108	21D83406D44	47: N80
C109, 110	21D84534B02	90
C111	21D82450B18	2: coded RED-BLK-WHT-GOLD
C112	21D82428B59	.01 uF +80-20%: 200 V
C113	21-124554	ZZ: NP0
C114	21-840713	120
C115	21D82450B16	0.62 ±10%: coded BLU-RED-GRAY-SILVER (TLC6112A)
C115	21D82450B48	0.75: coded VIO-GRN-GRY-GOLD (TLC6112B)
C116	21-122235	18: NP0
C117	21D82450B33	0.56: coded GRN-BLU-GRAY-GOLD (TLC6112A)
C117	21D82450B46	0.62: coded BLU-RED-GRY-GOLD (TLC6112B)
C118	21-122235	18: NP0
C119	21D82450B29	0.51: coded GRN-BLU-GRAY-GOLD (TLC6112A)
C119	21D82450B29	0.56: coded GRN-BLU-GRY-GOLD (TLC6112B)
C120	21-122235	18: NP0
C121	21D82450B33	0.56: coded GRN-BLU-GRAY-GOLD (TLC6112A)
C121	21D82450B48	0.75: coded VIO-GRN-GRY-GOLD (TLC6112B)
C122	21-82133G01	10: NP0 (TLC6112A)
C122	21-82610C22	20: NP0 (TLC6112B)
C123	21D82187B17	820 ±10%
C124	21D82428B59	.01 uF +80-20%: 200 V
C125	21-82133G01	10: NP0
C126	23D84762H04	2.2 uF ±20%: 25 V
C127	21-851845	11: NP0
C128	21D82450B48	0.75: coded VIO-GRN-GRAY-GOLD
C129	21-82428B28	.002 uF ±10%: 100 V
C130	21D84426B18	130
C131	23D84762H04	2.2 uF ±20%: 25 V
C132	21D82428B59	.01 uF +80-20%: 200 V
C133	8D82905G04	.068 uF ±10%: 50 V
C134	23D84762H04	2.2 uF ±20%: 25 V
C135	21D82428B59	.01 uF +80-20%: 200 V
C136	21D82450B10	4.3: coded YEL-ORG-WHT-GOLD
C137	21D84426B18	130
C138	21D82187B31	1500 ±10%: 100 V
C139	21D84426B21	80
C140, 141	21D82450B47	1.0: coded BRN-BLK-WHT-GOLD
C142	21D84426B62	190
C143	21D84534B07	330
C144	8D82905G04	.068 uF ±10%: 50 V
C145	21D82428B59	.01 uF +80-20%: 200 V
C146	21C82372C04	.05 uF +80-20%: 25 V
C148	21-82428B59	.01 uF +80-20%: 200 V
C149	8D83813H06	0.1 uF ±10%: 100 V
C150	21D82133G32	5.6 ±0.5 pF: NP0
C151	21D82450B48	0.75: coded VIO-GRN-GRAY-GOLD
C152	21D83406D57	13: NP0
C153	21D82133G19	15: NP0
C154	8D83813H06	0.1 uF ±10%: 100 V
C155	8D82905G04	.068 uF ±10%: 500 V
C156	23D83214C15	4.7 uF ±20%: 25 V
C157	21D82187B38	270 ±10%
C158	8D83813H06	0.1 uF ±10%: 100 V
C159	21D82187B27	2000 ±10%: 100 V
C160	8-83813H06	0.1 uF ±10%: 100 V
C161	21D82428B59	.01 uF +80-20%: 200 V
C162	21D82610C69	110: 200 V: N150
C163	21D84426B59	110
C164	21D82187B39	470 ±10%
C165	21D82428B59	.01 uF +80-20%: 200 V
C166	21D82187B39	470 ±10%

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode:
CR101	48D84217A01	germanium
CR103	48D84216A01	germanium
CR104	48D84216A01	silicon: hot-carrier
CR105	48D84216A01	silicon: hot-carrier
		LAMP, glow:
DS101	08E82420D62	neon: type NE-2
		INTEGRATED CIRCUIT:
IC101	51-84561L69	type M6707
IC102	51-84561L69	type M6707
		CONNECTOR, receptacle:
J101	9C84207B01	female: 7-contact
J102	9C84211B02	female: coaxial; miniature type
		COIL, RF:
L101	24D84115B03	8-1/2 turns: tapped: coded ORG; includes tuning core (coded YEL)
L102	24D84115B02	8-1/2 turns: coded RED; includes tuning core (coded YEL)
L103	24D84115B03	8-1/2 turns: tapped: coded ORG includes tuning core (coded YEL)
L104	24D84115B13	8-1/2 turns: tapped: coded ORG includes tuning core (coded YEL)
L105 thru L108	24D84113B07	4-1/2 turns: coded GRN includes tuning core (coded ORG)
L109	24D84114B05	3-1/2 turns: coded BLUE; includes tuning core coded ORG (TLC6112B)
L109	24D84114B04	4-1/2 turns; coded YEL; includes tuning core coded ORG (T1 C6112A)
L110, 111	24D84258B01	21 turns: coded BRN; includes tuning core (coded RED)
L112	24D84258B02	27 turns: tapped; coded RED includes tuning core (coded RED)
L113	24D84258B01	21 turns: coded BRN; includes tuning core (coded RED)
L114	24D84258B03	40 turns: coded ORG includes tuning core (note coded)
L120, 121	24C83961B01	choke; ferrite bead type
L123, 124	24D82135G10	choke; 100 uH
L125, 126	24D82835G26	choke; 71 uH
L127	24D82135G10	choke 100 uH
L128	24D82135G01	choke: 620 uH
		TRANSISTOR:
Q101	48R869494	N-P-N: type M9494
Q102	48R869651	field-effect: N-channel type M9651
Q103	48R869652	field-effect: N-channel type M9652
		RESISTOR, fixed: ±5%; 1 + W: unl. stated
R101	6S129232	3.9k ±10%
R102	6S127806	27k ±10%
R103	6-124A60	3k
R104	6-124A13	33
R105	6-124A13	33 (TLC6112A only)
R106	6S131652	39 ±10%
R107	6S129753	100 ±10%
R108	6-124A59	2.7k (TLC6112A)
R108	6-124A49	1k (TLC6112B)
R109	6-124A27	120 (TLC6112A)
R109	6-129806	330 (TLC6112B)
R110	6S129836	150 ±10%
R111	6S131652	39 ±10%
R112	6S129836	15k
R113	6S129236	15k
R114	6S124A23	82
R115	6S129236	15k
R116	6S129707	2.7k
R117	6S129526	33k
R118	6S128777	39k
R119	6S129707	2.7k
R120	6S129818	820
R121	6S129667	22k
R122	6S129804	2.2k
R123	6S129755	10 ±10%
R124	6S129526	33k
R125	6S129886	27k
R126	6S131526	18k
R127	6S128684	56k ±10%
		CRYSTAL UNIT, quartz:
Y101	48D84259B01	i-f filter
Y102	48D84259B02	i-f filter
Y103	48D84259B01	i-f filter
Y104	48D84259B03	i-f filter
Y105	48D84259B03	i-f filter
Y106	48D84104B01	discriminator

"MICOR" "SENSITRON" HIGH BAND RECEIVER RF & IF BOARD

TLD8270B SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TLD8271B	132-142
TLD8272B	142-150.8
TLD8273B	150.8-162
TLD8274B	162-174

TECHNICAL CHARACTERISTICS

INPUT IMPEDANCE		50 ohms
RF FREQUENCY RANGE		132-174 MHz
CHANNEL ELEMENT FREQUENCY RANGE		15.455-18.055 MHz
CHANNEL SPACING		30 kHz
NUMBER OF CHANNELS		1 (capable of up to 4 for special applications)
SELECTIVITY EIA SINAD		-100 dB @±30 kHz
INTERMODULATION EIA SINAD		-80 dB
MODULATION ACCEPTANCE EIA		±7 kHz
SENSITIVITY (50 OHMS RF INPUT IMPEDANCE)	20 dB Quieting	less than 0.5 microvolt
	EIA Sinad	less than 0.35 microvolt
OSCILLATOR (CHANNEL ELEMENT) STABILITY		±.0005% (AFC optional) from -30°C to +60° C ambient
SPURIOUS & IMAGE REJECTION		-100 dB
POWER REQUIREMENTS		regulated 9.6 volts @ 70 mA 13.8 volts @ 20 mA
CONSTRUCTION		fully solid-state, two integrated circuits
RECEIVER TYPE		FM superheterodyne single conversion
IF FREQUENCY		11.7 MHz or 11.8 MHz
CRYSTAL FILTER TYPE		dual resonator, mode coupled, monolithic crystal
DISCRIMINATOR TYPE		dual resonator, mode coupled, monolithic crystal
METERING		three test points critical to operation and alignment are accessible at a metering receptacle which permits testing with a Motorola portable test set, optional built-in metering, or any 50 microampere meter.

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

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1. DESCRIPTION

1.1 The fully solid-state receivers rf & i-f circuit board which is used for both base station and "Spectra TAC" applications, consist of an rf preselector, two integrated circuits, three transistors, two i-f crystal filters, plug-in channel elements, and a crystal discriminator. These components are used to develop a low-noise audio siganl from a frequency modulated "on-channel" rf carrier in the 132-174 MHz range.

1.2 All circuits are constructed on a single plug-in circuit board which is easily removed and replaced. All external dc and audio connections are made at a single row of pins which eliminate interconnecting wires; rf input is provided by a single plug-in coaxial cable. Circuit board plating is on both sides of the board with all components mounted on the back side. All alignment points are accessible from the front of the station.

2. FUNCTIONAL OPERATION

This circuit board is a highly selective, crystal controlled, single conversion FM receiver (less audio amplifier, squelch circuitry, and speaker). Bandwidth and selectivity characteristics are determined by rf preselector coils and i-f crystal filters. Plug-in crystal oscillator modules (channel elements) provide stable frequency control. Integrated circuits are used for all amplification and limiting after the first crystal filter section which produce high i-f signal gain and exceptionally high reliability. A crystal discriminator is used to provide high audio recovery from the i-f signal. Refer to schematic diagram for more circuit details.

3. MAINTENANCE

3.1 GENERAL

This section of the manual provides the maintenance procedures for the receiver rf and i-f section of the receiver. These bench tests include metering measurements and procedures for testing and troubleshooting, including integrated circuit check-out.

NOTE

The receiver rf and i-f board must be installed in the receiver for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation and testing to provide a good rf ground to all stages of the receiver. The board may be installed in the station or a "Micor" mobile radio set for testing.

3.2 "SPECTRA TAC" 20 DB QUIETING SENSITIVITY TEST

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service.

It may be performed using a Motorola S-1056B thru S-1059B Portable Test Set or optional built-in receiver metering. J101 can accommodate only the built-in metering set or the portable test set, but not both simultaneously. Plugging a portable test set in a receiver that has built-in metering will disconnect the built-in metering cable.

NOTE

The receiver shield must be in place while performing this test.

3.2.1 Using the Portable Test Set and an AC Voltmeter

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver.

Step 4. Using a TEK-37A Adapter Cable, connect a Motorola portable test set or meter panel to the station as follows:

--Connect the adapter cable 20-pin connector to the receptacle on the front of the test set or meter panel.

--Connect the adapter cable 7-pin white "metering" plug to the metering receptacle on the receiver rf and i-f board.

Step 5. Set the portable test set switches as follows:

--Set the function switch to the RCVR position.

--Set the meter reversing switch to the OFF position.

--Set the adapter cable SENS switch to the 100 mV position. If the adapter cable has no SENS switch, the unit operates at 100 mV all of the time.

--Set the adapter cable reference switch to position A or position B.

Step 6. Refer to the meter reading table in paragraph 3.3.1. Set the test set selector switch to the positions called for in the table and observe the test set meter. Notice that the meter readings given in the table are minimums.

Step 7. Connect an ac voltmeter across pins 1 and 18 of the audio control module.

Step 8. (PL receivers only). Disable PL, using the switch on the PL module.

Step 9. Set the receiver squelch control fully counterclockwise (unsquelched).

Step 10. Adjust the LINE LEVEL control so the ac voltmeter reads 565 mV volts ac.

Step 11. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until test set meter position 4 reads exactly zero.

Step 12. Slowly decrease the signal generator output level until the ac voltmeter reads 565 mV ac (20 dB down from 565 mV ac). Switch to a lower voltmeter scale if necessary. The generator output now indicates the 20 dB quieting sensitivity and should be 0.5 microvolt, or less (0.25 microvolt with preamplifier).

Step 13. Readjust the LINE LEVEL control as described in the MAINTENANCE section of the manual.

3.2.2 Using the Optional Built-In Receiver Metering

3.2.2.1 Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" receivers must also be PL disabled. Turn metering POWER switch on.

3.2.2.2 Set the meter selector switch to position 6 and the speaker switch to the OFF position. Adjust the receiver LINE LEVEL control for 50 uA as indicated on the meter.

3.2.2.3 Connect a signal generator to the station antenna receptacle and adjust it to the receiver frequency. Set the rf output to minimum.

3.2.2.4 Increase the signal generator output until the meter reading drops to 5 uA. The generator output level now indicates the 20 dB quieting sensitivity and should be 0.5 microvolt, or less (0.25 microvolt, or less, with preamplifier). Readjust the line level as described in the MAINTENANCE section in the front of the manual.

3.3 "SPECTRA TAC" TROUBLESHOOTING

3.3.1 Circuit Measurements

3.3.1.1 General

A failure in almost any part of the rf and i-f section will produce an improper meter reading on one or more of the test points. Improper alignment will also cause improper meter readings.

A "0" meter reading in position 3 or 5 indicates either (1) insufficient drive from a preceding stage or (2) a defective component at the metering point.

3.3.1.2 Procedure Using Portable Test Set or Optional Built-In Receiver Metering

3.3.1.2.1 (Portable test set only). Connect the 20-pin plug of the adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve test set battery life. The plug acts as an on-off switch completing the battery circuit.

3.3.1.2.2 (Portable test set only). Connect the white "metering" plug of the adapter cable to the metering receptacle on the receiver rf and i-f circuit board.

3.3.1.2.3 Compare the current readings in SELECTOR SWITCH positions 3, 4 and 5 with those in the following table. A low reading on meter position 3 indicates a defective channel element or multiplier circuit. An improper meter reading in position 4 or 5 readings indicate a malfunction elsewhere in the receiver, which can most rapidly be found by checking rf and i-f voltages, per the schematic diagram.

TYPICAL RECEIVER RF & IF METER READINGS TABLE
(No Input Signal Applied)

SELECTOR SWITCH POSITION	READING (MICROAMPS)	CIRCUIT METERED
3	15	Channel Element Output
4	0 ±2	Discriminator Output
5	1 or less (If unreadable, inject 1.0 V on-channel signal at antenna receptacle; 20 uA, typical, should be obtained.)	3rd i-f Amplifier and Limiter

3.3.2 Input Voltages

If there are no test set indications at one or more of the metered points, check the dc input voltages to the receiver rf and i-f circuit board.

P904-9	A+ (13.8 V dc with reference to chassis)
P904-6 P904-13	9.6 V dc (with reference to chassis) (±0.5 V)

If test set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

3.3.3 Alignment as a Troubleshooting Technique

Low test set readings, improper discriminator output, and otherwise abnormal performance are very often corrected by re-alignment. Therefore, alignment should be the first troubleshooting step performed for these symptoms. Many technicians prefer to use alignment as the first troubleshooting step in all cases.

3.3.4 Isolating Defective Components

If test set readings are abnormal or tests indicate sub-normal performance, a logical troubleshooting procedure is required to isolate the defective component. The accompanying troubleshooting chart summarizes troubleshooting in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component.

3.3.5 Troubleshooting Integrated Circuits

The IC's in the receiver rf and i-f section may be checked by dc voltage measurements. Proper voltages are shown on the schematic diagram.

3.3.6 Troubleshooting Crystals

A defective filter crystal can best be found by performing an i-f gain check per the schematic diagram. A defective crystal will show an abnormally high insertion loss. Before making the gain check, verify, using an ohmmeter, that the center pins of all four filter crystals are connected to the associated crystal case. The resistance between the center pin and the case should be less than 0.1 ohm. The loss of this ground may cause errors in gain measurements because of the loss of shielding effectiveness. If the filter is found to be defective because of high insertion loss or an ungrounded case, it should be replaced.

Before replacing the discriminator crystal, verify that all components associated with the discriminator circuitry are not defective. Also, verify, in a manner similar to that used for the filter crystals, that pin 2 is connected (less than 0.1 ohm) to the crystal case. The discriminator crystal should be replaced if found defective.

NOTE

If the discriminator crystal, Y105, is replaced, it must be physically oriented so that the index dot on the top of the filter can is toward IC102 on the circuit board. This crystal matches specific input and output impedance and will not perform satisfactorily if reversed. All other filter crystals, if replaced, may be oriented in either direction.

.4 20 DB QUIETING SENSITIVITY TEST (BASE STATION)

This performance test may be used after epair and alignment to assure that the receiver neets all specifications before it is returned to ervice.

It may be performed using a Motorola -1056B thru S-1059B Portable Test Set or ptional built-in station metering.

NOTE

The receiver shield must be in place while performing this test.

.4.1 Using the Portable Test Set

.4.1.1 Unsquelch the receiver by turning the SQUELCH control fully counter-lockwise. "Private-Line" stations must also be PL disabled.

.4.1.2 Connect the red "control" plug of the adapter cable to the control eceptacle on the local or remote control board. his is the large board in the applicable local or emote control package.

.4.1.3 Set the multiplier switch on the test set to the 2 V AC position.

.4.1.4 Adjust the VOLUME control until 2 volts is obtained on meter position 1. Set the speaker switch of the test set to the OAD position to silence the test set speaker during ne test.

.4.1.5 Connect the signal generator to the station antenna receptacle and adjust to the receiver frequency. Set the rf output to inimum.

.4.1.6 Increase the signal generator output until the meter reading drops to .2 olts in meter position 11 (place the multiplier witch in the .2 V AC position). The generator utput level now indicates the 20 dB quieting sen-itivity and should be 0.5 microvolt, or less 0.25 microvolt with preamplifier).

.4.2 Using the Optional Built-In Station Metering

.4.2.1 Unsquelch the receiver by turning the SQUELCH control fully counter-lockwise. "Private-Line" stations must also be L disabled.

3.4.2.2 Set the range switch on an ac voltmeter to the 2 V AC position and connect the voltmeter across the speaker terminals of the built-in station meter kit. Adjust the station VOLUME control for 2 volts as indicated on the voltmeter.

3.4.2.3 Connect a signal generator to the station antenna receptacle and adjust it to the receiver frequency. Set the rf output to minimum.

3.4.2.4 Increase the signal generator output until the meter reading drops to .2 volts. The generator output level now indicates the 20 dB quieting sensitivity and should be 0.5 microvolt, or less (0.25 microvolt, or less, with preamplifier).

3.5 TROUBLESHOOTING (BASE STATION)

3.5.1 Circuit Measurements

3.5.1.1 General

A failure in almost any part of the rf and i-f section will produce an improper meter reading on one or more of the test points. Improper alignment will also cause improper meter readings.

A "0" meter reading in position 3 or 5 indicates either (1) insufficient drive from a preceding stage or (2) a defective component at the metering point.

3.5.1.2 Procedure Using Portable Test Set or Optional Built-In Station Metering

3.5.1.2.1 (Portable test set only). Connect the 20-pin plug of the adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve test set battery life. The plug acts as an on-off switch completing the battery circuit.

3.5.1.2.2 (Portable test set only). Connect the red "control" plug of the adapter to the receptacle on the local or remote control board. Connect the white "metering" plug of the adapter cable to the metering receptacle on the receiver rf and i-f circuit board.

3.5.1.2.3 Compare the current readings in SELECTOR SWITCH positions 3, 4 and 5 with those in the following table. A low reading on meter position 3 indicates a defective channel element or multiplier circuit. An improper meter reading in position 4 or 5 readings indicate a mal-

function elsewhere in the receiver, which can most rapidly be found by checking rf and i-f voltages, per the schematic diagram.

TYPICAL RECEIVER RF & I-F METER READINGS TABLE
(No Input Signal Applied)

Selector Switch Position	Reading (Microamps)	Circuit Metered
3	15	Channel Element Output
4	0 ±2	Discriminator Output
5	1 or less (If unreadable, inject 1.0 V on-channel signal at antenna receptacle; 20 uA, typical, should be obtained.)	

3.5.2 Input Voltages

If there are no test set indications at one or more of the metered points, check the dc input voltages to the receiver rf and i-f circuit board. Key and unkey the transmitter to see if the voltages are switched.

P904-9	A + (13.8 V dc with reference to chassis)
P904-6	
P904-13	9.6 V dc (with reference to chassis) (±0.5 V)

If thest set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

NOTE

In "Private-Line" radios, the transmitter cannot be keyed if the PL encoder board is removed unless a jumper is connected from pin 8 to pin 10 of the exciter to complete the keying circuit. This jumper is permanently connected in exciters for non-"Private-Line" operation.

3.5.3 Alignment as a Troubleshooting Technique

Low test set readings, improper discriminator output, and otherwise abnormal performance are very often corrected by re-alignment. Therefore, alignment should be the first troubleshooting step performed for these symptoms. Many technicians perfer to use alignment as the first troubleshooting step in all cases.

3.5.4 Isolating Defective Components

If test set readings are abnormal or test indicate sub-normal performance, a logic troubleshooting procedure is required to isolate the defective component. The accompanying troubleshooting chart summarizes troubleshooting in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component.

3.5.5 Troubleshooting Integrated Circuits

Integrated circuits (IC's) are very relia components and should not be replaced until all checks have proven definitely that the IC is the defective component. Removal of an IC is time consuming and often ruins the part. Therefore, a few extra checks before that task is attempted are worthwhile. Before replacing a bad IC, make sure that the external components in the circuit are normal.

The IC's in the receiver rf and i-f sectio may be checked by dc voltage measurements. Proper voltages are shown on the schematic diagra

3.5.6 Troubleshooting Crystals

A defective filter crystal can best be found by performing an i-f gain check per the schematic diagram. A defective crystal will show an abnormally high insertion loss. Before making the gain check, verify, using an ohmmeter, that the center pins of all four filter crystals are connected to the associated crystal case. The resistance between the center pin and the case should be less than 0.1 ohm. The loss of this ground may cause errors in gain measurements because of the loss of shielding effectiveness. If the filter is found to be defective because of high insertion loss or an ungrounded case, it should be replaced.

Before replacing the discriminator cryst verify that all components associated with the discriminator circuitry are not defective. Also, veri in a manner similar to that used for the filter crys that pin 2 is connected (less than 0.1 ohm) to the crystal case. The discriminator crystal should be replaced if found defective.

NOTE

If the discriminator crystal, Y105, is replaced, it must be physically oriented so that the index dot on the top of the filter can is toward IC102 on the circuit board. This crystal matches specific input and output impedances and will not perform satisfactorily if reversed. All other filter crystals, if replaced, may be oriented in either direction.

3.5.7 Troubleshooting in the Optional AFC Amplifier

If the AFC amplifier is suspected to be malfunctioning, perform the following test:

3.5.7.1 If an optional built-in station meter is used, switch to position 4 to monitor the discriminator output. Otherwise, connect the Motorola test set to monitor the discriminator output (position 4).

3.5.7.2 Insert a shorting tool into the AFC DISABLE (short contact on board to receiver shield) and adjust the input signal or the receiver channel element warping capacitor for a test set meter indication of approximately 5 uA off zero center scale.

3.5.7.3 Remove the shorting tool to activate the AFC amplifier. The test set meter indication should return to within 2 uA of zero center scale.

3.6 TWO-RECEIVER STATIONS

The two-receiver coupler used to connect both receivers to an antenna does not require alignment. Align both receivers while disconnected from the two-receiver coupler. Inject siganl generator output into each receiver at the rf preselector (or preamp) and align. Then re-connect the two-receiver coupler and check for proper operation.

3.7 FIELD CONVERSION TO SHIFTED I-F

A standard 11.7 MHz i-f receiver can easily be converted to operate at the shifted i-f of 11.8 MHz. Replace crystal filters Y101 through Y105 with the 11.8 MHz parts; refer to the parts list for the TLD8740A Shifted I-F Crystal Kit for the part numbers. Finally, replace the channel element, using the 11.8 MHz i-f formula for calculating the crystal frequency.

RECEIVER ALIG

A. FREQUEN R ALIGNMENT (Cont'd)

Where:

f_o = channel eleme H

f_c = carrier frequ

11.7 MHz IF Rece

132

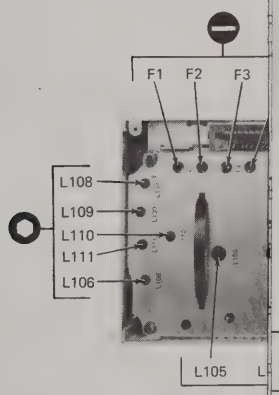
$$f_o = \frac{f_c + 11.7\ M}{9}$$

150

$$f_o = \frac{f_c - 11.7\ M}{9}$$

& REV. H	STAGE AND PROCEDURE
REV.	Adjust signal generator output for 25 uA meter indication. Detune L108 until meter indication decreases to 15 uA. Repeak L110 and L111 for maximum meter indication. Repeat entire step.
REV.	Repeak L108 and L109 for maximum meter indication.
REV.	Repeak L101 through L105 for maximum meter indication. Repeat. Peak L103 thru L105 for minimum indication on meter 6 (maximum quieting).
REV.	ON-FREQUENCY ADJUSTMENT - Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, test set meter position 5 should indicate rise when transmitter is keyed (if necessary connect antenna). Check test set position 4 reading with transmitter keyed. 0 indicates on-frequency condition. Adjust F1 warp capacitor for exact 0 reading. DO NOT READJUST L108 OR L109 AFTER THESE ADJUSTMENTS ARE MADE. If the receiver is equipped with AFC, short the AFC DISABLE contact while adjusting F1.
	Perform 20 dB quieting sensitivity measurement as check of alignment.

B. RECEIVER AD



FAEPS-24812-A
(P413)

st set is used, connect an
oss pins 1 and 18 of the
dule for this reading.

C. TYPICAL REC

(NO INPUT

TEST SET SELECTOR SWITCH POSITION	RF
3	
4	
5	1 or less (if maximum on antenna rece cal, should b

RECEIVER ALIGNMENT PROCEDURE

A. FREQUENCY CALCULATIONS

Where:

f_o = channel element frequency

f_c = carrier frequency

11.7 MHz IF Receivers 11.8 MHz IF Receivers

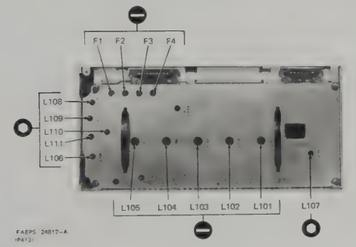
132-150.8 MHz

$$f_o = \frac{f_c + 11.7\ \text{MHz}}{9} \quad \text{or} \quad \frac{f_c + 11.8\ \text{MHz}}{9}$$

150.8-174 MHz

$$f_o = \frac{f_c - 11.7\ \text{MHz}}{9} \quad \text{or} \quad \frac{f_c - 11.8\ \text{MHz}}{9}$$

B. RECEIVER ADJUSTMENT LOCATIONS



C. TYPICAL RECEIVER METER READINGS

(NO INPUT SIGNAL APPLIED)

TEST SET SELECTOR SWITCH POSITION	READING (uA)	CIRCUIT METERED
3	15	Channel Element Output
4	0 ±2	Discriminator Output
5	1 or less (if unreadable, inject maximum on-channel signal at antenna receptacle; 20 uA, typical, should be obtained).	3rd IF Amplifier and Limiter

D. RF PREAMPLIFIER ALIGNMENT

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
1				If the station is equipped with an optional preamplifier, disconnect and bypass the preamplifier. Align the receiver then, reconnect the preamplifier.
2	L3, L2, L1	5	METER REV.	Adjust L3, L2, and L1 in that order for maximum test set meter indication. Repeat.
3				Tune L2 for maximum quieting.

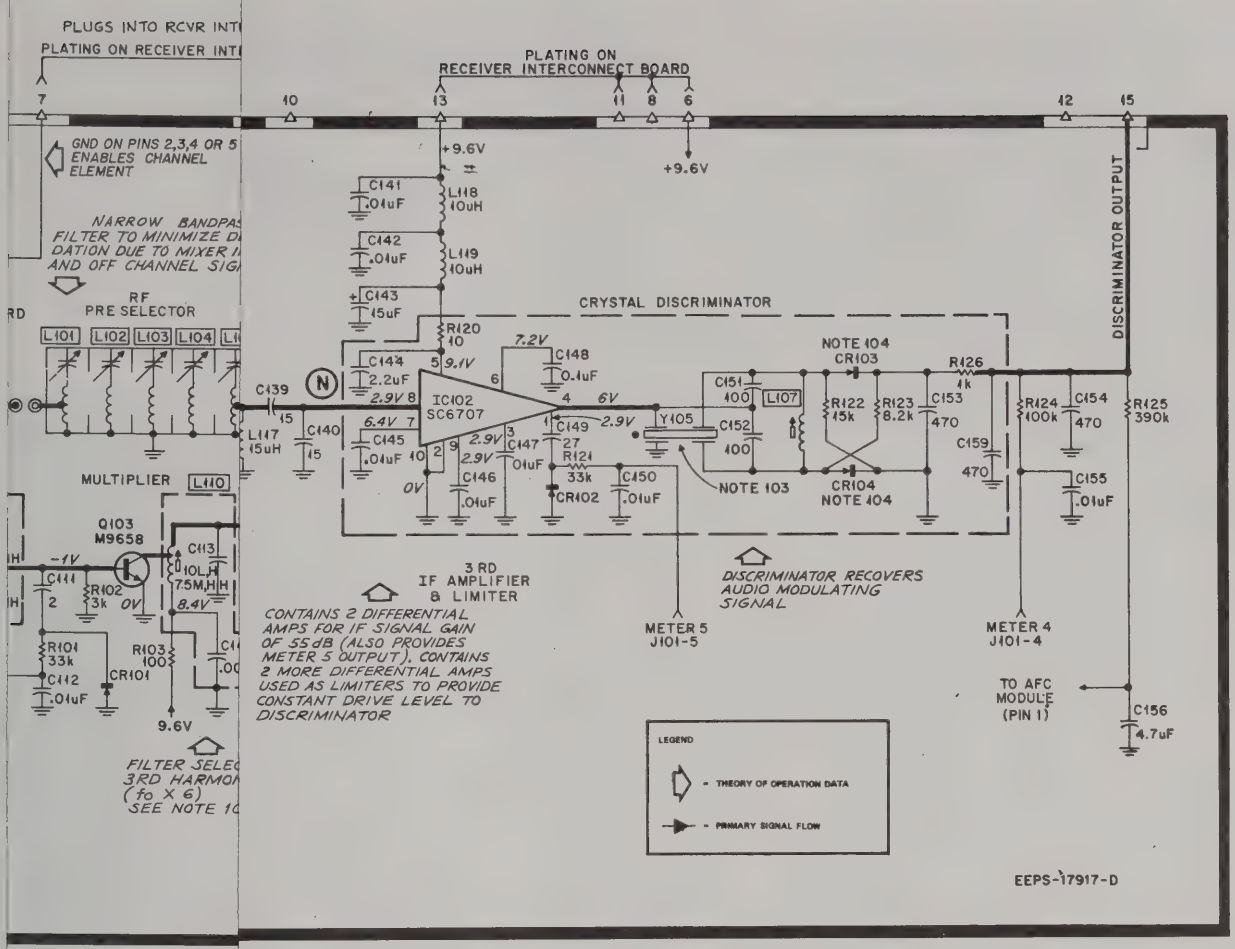
E. RECEIVER ALIGNMENT

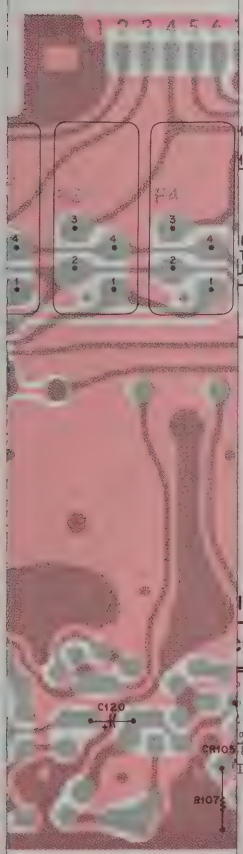
STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
1	L108, L109	3	METER REV.	CHANNEL ELEMENT OUTPUT (3RD HARMONIC) - Adjust L108 and L109 for maximum meter indication. On multi-frequency receivers make this adjustment with frequency selector switch in F1 position.
2	L107	4	A or B (Test Set must be equipped with 11.7 MHz crystal in corresponding socket) (and with an 11.8 MHz crystal in corresponding socket for some two-receiver stations).	DISCRIMINATOR - Unsquelch the receiver by turning the squelch control fully counterclockwise. "Private-Line" radios must also be PL disabled. Insert 11.7 MHz (or 11.8 MHz) injection probe of test set into L106 opening of receiver shield being careful not to contact circuit board. Insert probe into hole far enough to obtain a meter 5 indication of 15 uA (signal is "sprayed" into receiver). Adjust L107 for 0 center reading on top scale with selector switch of test set in position 4. Adjustment is critical and should be exactly on 0. Remove probe.
3	L110, L111	5	METER REV.	MULTIPLIER - Connect signal generator to antenna input and apply a carrier frequency signal. Adjust L110 and L111 for maximum meter indication. If two peaks are observed, use peak with slugs farthest from circuit board. If a meter 5 indication cannot be obtained, connect center conductor of signal generator cable directly to the mixer gate.
4	L101, L102, L103, L104, L105, L106	5	METER REV.	RF PRESELECTOR AND MIXER - Turn out L101 thru L105 slugs until tip of each tuning screw extends approx. 1/4 inch beyond spring (mechanical parts list code 8). Connect signal generator to antenna input and apply carrier frequency signal. Tune L101 thru L105 for peak on meter position 5. Turn L103, L104, and L105 slugs in one turn. Peak L106 thru L101, in that order, on meter position 5. Decrease signal generator output as necessary to maintain indication between 10 and 25 uA.

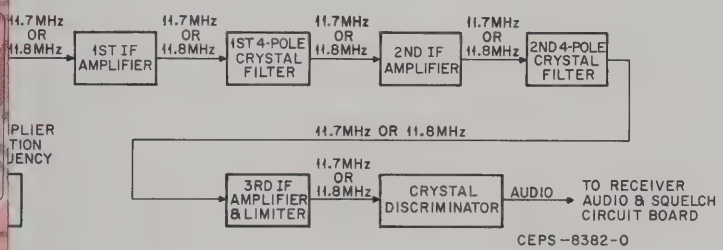
E. RECEIVER ALIGNMENT (Cont'd)

STEP	ADJUST	SELECTOR SWITCH POSITION	OSC. & METER REV. SWITCH	STAGE AND PROCEDURE
5	L108, L110, L111	5	METER REV.	Adjust signal generator output for 25 uA meter indication. Detune L108 until meter indication decreases to 15 uA. Repeak L110 and L111 for maximum meter indication. Repeat entire step.
6	L108, L109	3	METER REV.	Repeak L108 and L109 for maximum meter indication.
7	L101, L102, L103, L104, L105	5 6* OFF	METER REV. OFF	Repeak L101 through L105 for maximum meter indication. Repeat. Peak L103 thru L105 for minimum indication on meter 6 (maximum quieting).
8	F1, F2, F3, F4	5 4	METER REV.	ON-FREQUENCY ADJUSTMENT - Disconnect signal generator and transmit carrier signal from transmitter normally received. If transmitter is known to be on frequency, test set meter position 5 should indicate rise when transmitter is keyed (if necessary connect antenna). Check test set position 4 reading with transmitter keyed. 0 indicates on-frequency condition. Adjust F1 warp capacitor for exact 0 reading. DO NOT READJUST L108 OR L109 AFTER THESE ADJUSTMENTS ARE MADE. If the receiver is equipped with AFC, short the AFC DISABLE contact while adjusting F1.
9	-	-	-	Perform 20 dB quieting sensitivity measurement as check of alignment.

* If the portable test set is used, connect an ac voltmeter across pins 1 and 18 of the audio control module for this reading.







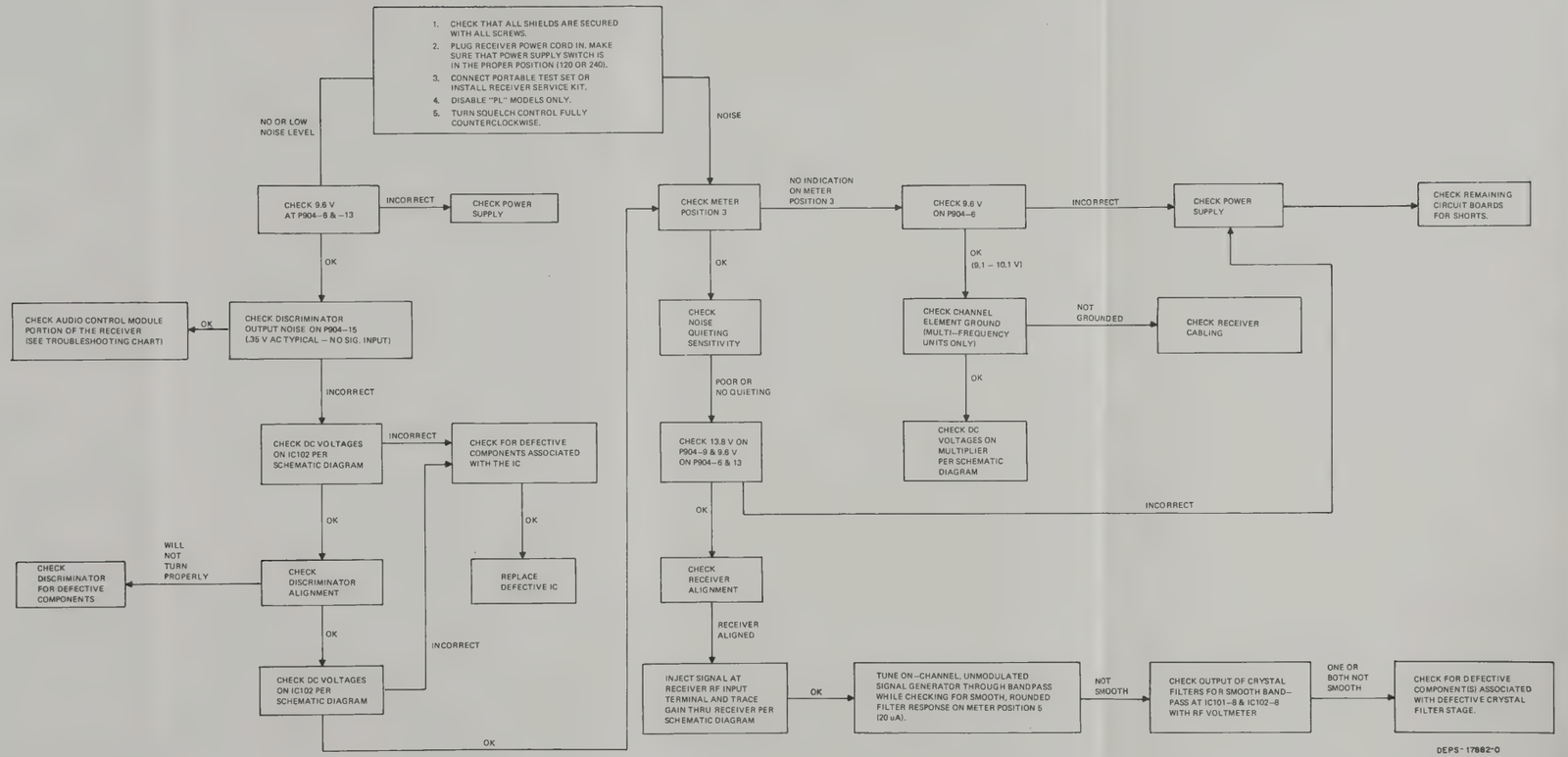
ISIONS PEPS-17915-D

CHANGE	LOCATION
-129887 : 1/4 W 4A65 %; 1/4 W	IC102, PIN 8
8R869651, TO 48-869943,	MIXER

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver RF & I-F Board
Schematic Diagram, Circuit Board Detail and Block Diagram
Motorola No. PEPS-17915-E
7/15/81- UP

RECEIVER RF & IF CIRCUIT BOARD TROUBLESHOOTING CHART


1. CHECK THAT ALL SHIELDS ARE SECURED WITH ALL SCREWS.
2. PLUG RECEIVER POWER CORD IN. MAKE SURE THAT POWER SUPPLY SWITCH IS IN THE PROPER POSITION (120 OR 240).
3. CONNECT PORTABLE TEST SET OR INSTALL RECEIVER SERVICE KIT.
4. DISABLE "PL" MODELS ONLY.
5. TURN SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
NO OR LOW NOISE LEVEL
NOISE
CHECK 9.6 V AT P904–6 & –13
INCORRECT
CHECK POWER SUPPLY
OK
CHECK AUDIO CONTROL MODULE PORTION OF THE RECEIVER (SEE TROUBLESHOOTING CHART)
OK
CHECK DISCRIMINATOR OUTPUT NOISE ON P904–15 (.35 V AC TYPICAL – NO SIG. INPUT)
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
INCORRECT
CHECK FOR DEFECTIVE COMPONENTS ASSOCIATED WITH THE IC
OK
OK
WILL NOT TURN PROPERLY
CHECK DISCRIMINATOR FOR DEFECTIVE COMPONENTS
CHECK DISCRIMINATOR ALIGNMENT
REPLACE DEFECTIVE IC
OK
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
OK
CHECK METER POSITION 3
NO INDICATION ON METER POSITION 3
CHECK 9.6 V ON P904–6
INCORRECT
CHECK POWER SUPPLY
CHECK REMAINING CIRCUIT BOARDS FOR SHORTS.
OK
OK (9.1 – 10.1 V)
CHECK NOISE QUIETING SENSITIVITY
CHECK CHANNEL ELEMENT GROUND (MULTI–FREQUENCY UNITS ONLY)
NOT GROUNDED
CHECK RECEIVER CABLING
POOR OR NO QUIETING
OK
CHECK 13.8 V ON P904–9 & 9.6 V ON P904–6 & 13
CHECK DC VOLTAGES ON MULTIPLIER PER SCHEMATIC DIAGRAM
OK
INCORRECT
CHECK RECEIVER ALIGNMENT
RECEIVER ALIGNED
INJECT SIGNAL AT RECEIVER RF INPUT TERMINAL AND TRACE GAIN THRU RECEIVER PER SCHEMATIC DIAGRAM
OK
TUNE ON –CHANNEL, UNMODULATED SIGNAL GENERATOR THROUGH BANDPASS WHILE CHECKING FOR SMOOTH, ROUNDED FILTER RESPONSE ON METER POSITION 5 (20 uA).
NOT SMOOTH
CHECK OUTPUT OF CRYSTAL FILTERS FOR SMOOTH BAND–PASS AT IC101–8 & IC102–8 WITH RF VOLTMETER
ONE OR BOTH NOT SMOOTH
CHECK FOR DEFECTIVE COMPONENT(S) ASSOCIATED WITH DEFECTIVE CRYSTAL FILTER STAGE.
DEPS-17882-O

RECEIVER RF & IF BOARD

101. RECEIVER FREQUENCY CALCULATION:

132-150.8 MHz: (HIGH SIDE INJECTION)

$f_c = 9f_c - 11.7$ MHz OR $9f_c - 11.8$ MHz

$f_c = \frac{f_c + 11.7 \text{ MHz}}{9}$ OR $\frac{f_c + 11.8 \text{ MHz}}{9}$

150.8-174 MHz (LOW SIDE INJECTION)

$f_c = 9f_c + 11.7$ MHz OR $9f_c + 11.8$ MHz

$f_c = \frac{f_c - 11.7 \text{ MHz}}{9}$ OR $\frac{f_c - 11.8 \text{ MHz}}{9}$

WHERE: f_c = CARRIER FREQUENCY f_e = CHANNEL ELEMENT FREQUENCY

102. DASHED LINES REPRESENT SHIELDING.
103. INDEX DOT ON Y105 CRYSTAL CAN INDICATES PHYSICAL ORIENTATION REQUIRED
104. DIODES CR103 AND CR104 ARE SHOWN FOR 150.8-174 MHz MODELS. REVERSE POLARITY OF THESE DIODES FOR 132-150.8 MHz MODELS.
105. RF VOLTAGES TAKEN WITH MOTOROLA SOLID-STATE DC MULTIMETER WITH PLUG-IN RF PROBE.
106. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.
107. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLT-METER IN RESPECT TO CHASSIS GROUND.

EPS-8381-A

DC VOLTAGE TABLE FOR IC'S

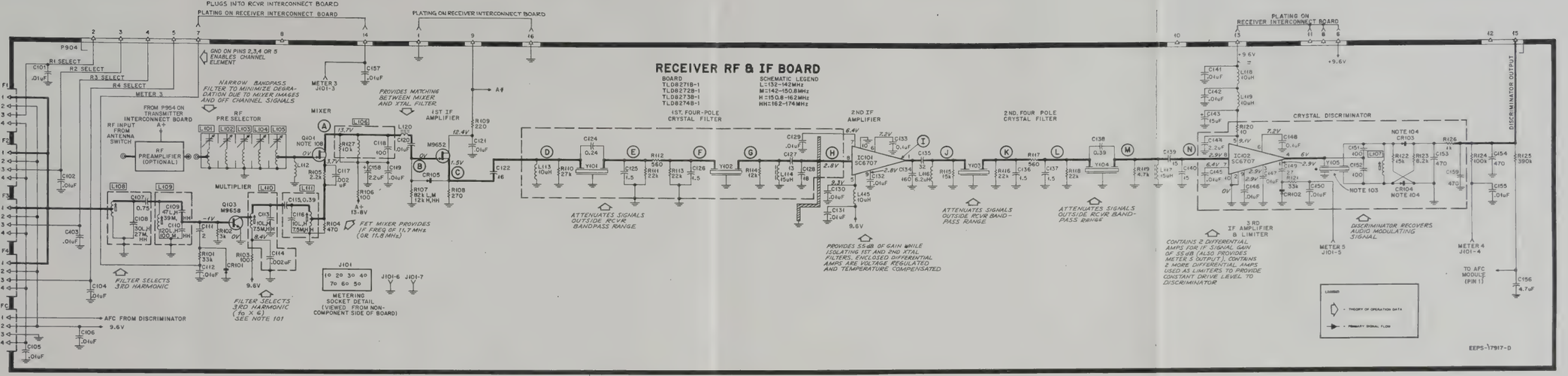
IC101		IC102	
PIN	VOLTAGE	PIN	VOLTAGE
1	2.8 V	1	2.9 V
5	9.3 V	2	0 V
6	7.2 V	3	2.9 V
7	6.4 V	4	6 V
8	2.8 V	5	9.1 V
9	2.8 V	6	7.2 V
10	0 V	7	6.4 V
		8	2.9 V
		9	2.9 V
		10	0 V

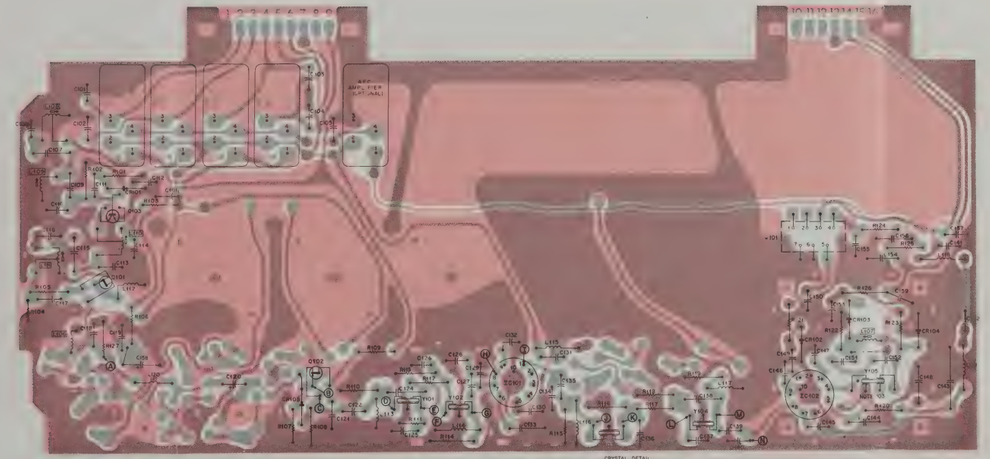
EPS-6360-A

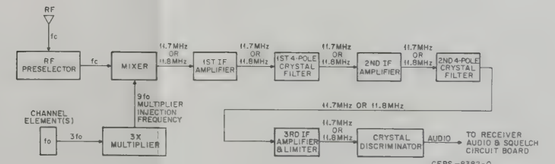
RECEIVER RF VOLTAGE TABLE

SET RF INPUT AT ANT. TO OBTAIN (NOTE 105)	AT TEST POINT	RF INPUT SHOULD BE (MAY VARY APPROX. 2 TO 1)
300 mV	A	13 mV
	B	13 mV
	C	8 mV
	D	3 mV
	E	4 mV
	F	5 mV
	G	5 mV
	H	13 mV
50 mV	I	50 uV
	J	10 uV
	K	14 uV
	L	20 uV
	M	21 uV
	N	72 uV

EPS-8379-O


RECEIVER RF & IF BOARD
BOARD
TLD8271B-1
TLD8272B-1
TLD8273B-1
TLD8274B-1
SCHEMATIC LEGEND
L=132-142MHz
M=142-150.8MHz
H=150.8-162MHz
HH=162-174MHz
PLUGS INTO RCVR INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
PLATING ON RECEIVER INTERCONNECT BOARD
P904
GND ON PINS 2,3,4 OR 5 ENABLES CHANNEL ELEMENT
NARROW BANDPASS FILTER TO MINIMIZE DEGRADATION DUE TO MIXER IMAGES AND OFF CHANNEL SIGNALS
PROVIDES MATCHING BETWEEN MIXER AND XTAL FILTER
R1 SELECT
R2 SELECT
R3 SELECT
R4 SELECT
METER 3
METER 3 J101-3
FROM P964 ON TRANSMITTER INTERCONNECT BOARD
RF INPUT FROM ANTENNA SWITCH
RF PREAMPLIFIER (OPTIONAL)
RF PRE SELECTOR
MIXER
1ST IF AMPLIFIER
1ST. FOUR-POLE CRYSTAL FILTER
2ND IF AMPLIFIER
2ND. FOUR POLE CRYSTAL FILTER
CRYSTAL DISCRIMINATOR
MULTIPLIER
CHANNEL ELEMENTS
AFC
AFC FROM DISCRIMINATOR
9.6V
FILTER SELECTS 3RD HARMONIC
FILTER SELECTS 3RD HARMONIC (fo X 6) SEE NOTE 101
ATTENUATES SIGNALS OUTSIDE RCVR BANDPASS RANGE.
PROVIDES 55dB OF GAIN WHILE ISOLATING 1ST AND 2ND XTAL FILTERS, ENCLOSED DIFFERENTIAL AMPS ARE VOLTAGE REGULATED AND TEMPERATURE COMPENSATED
ATTENUATES SIGNALS OUTSIDE RCVR BAND-PASS RANGE
ATTENUATES SIGNALS OUTSIDE RCVR BAND-PASS RANGE
CONTAINS 2 DIFFERENTIAL AMPS FOR IF SIGNAL GAIN OF 55dB (ALSO PROVIDES METER 5 OUTPUT), CONTAINS 2 MORE DIFFERENTIAL AMPS USED AS LIMITERS TO PROVIDE CONSTANT DRIVE LEVEL TO DISCRIMINATOR
3RD IF AMPLIFIER & LIMITER
DISCRIMINATOR RECOVERS AUDIO MODULATING SIGNAL
METER 5 J101-5
METER 4 J101-4
TO AFC MODULE (PIN 11)
DISCRIMINATOR OUTPUT
FET MIXER PROVIDES IF FREQ OF 11.7 MHz (OR 11.8MHz)
METERING SOCKET DETAIL (VIEWED FROM NON-COMPONENT SIDE OF BOARD)
J101
J101-6
J101-7
THEORY OF OPERATION DATA
PRIMARY SIGNAL FLOW
EEPS-17917-D


SHOWN FROM SOLDER SIDE
IMPORTANT- ORIENT INDEX DOT ON TOP OF CAN AS SHOWN ON CIRCUIT BOARD DETAIL
COMPONENT SIDE
SOLDER SIDE

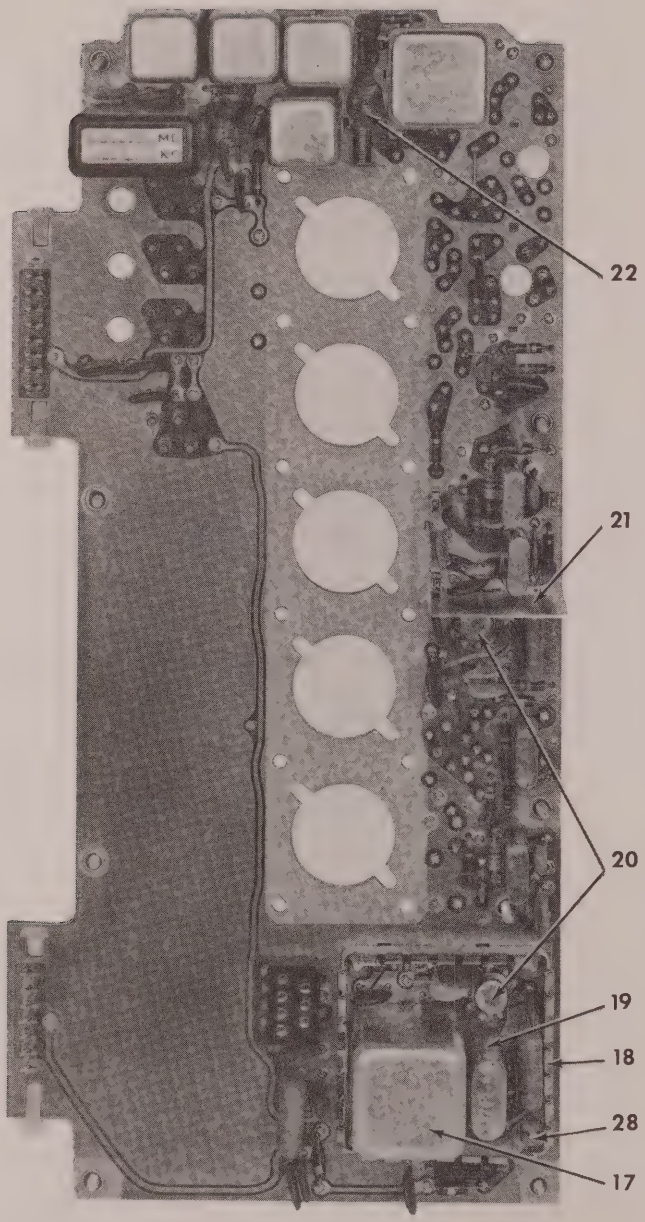


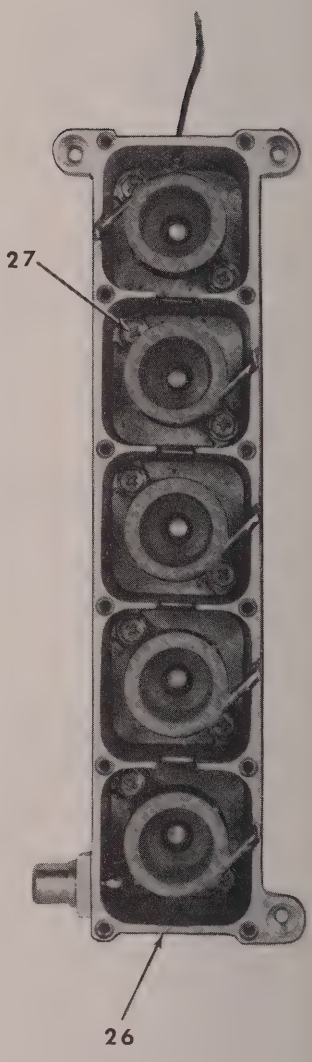
REVISIONS PEPS-17915-D

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLD8271BV TLD8272BV TLD8273V TLD8274BV	R119	FROM 1-129887 12K ±5% 1/4 W TO 6-124A65 4.7K ±5% 1/4 W	IC102, PIN 8
TLD8271B-1 TLD8272B-1 TLD8273B-1 TLD8274B-1	C101	FROM 48-869431, M9631 TO 48-869943, M9943	SINGER

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM
Receiver RF & I-F Board
Schematic Diagram, Circuit Board Detail
and Block Diagram
Motorola No. PEPS-17915-E
7/15/81- UP

HIGH BAND RECEIVER RF & IF BOARD





CEPS—6142—D
(3—3000-025, S-3000-K-25,
S-3000-I-25, S-3000-G-25)

"MICOR" "SENSITRON"
UHF RECEIVER RF & IF BOARD
MODELS TRE1201BA, 1203BA, 1204BA, 1205BA

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TRE1201BA	406-420
TRE1203BA	450-470
TRE1204BA	470-494
TRE1205BA	494-512

TECHNICAL CHARACTERISTICS

CHANNEL SPACING		25 kHz	
EIA MODULATION ACCEPTANCE		±7 kHz minimum	
FREQUENCY STABILITY		AFC channel element maintains receiver frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient temperature (+25°C reference).	
INPUT IMPEDANCE		50 ohms	
SENSITIVITY	20 DB QUIETING	NO PREAMPLIFIER: 0.5 uV	WITH PREAMPLIFIER: 0.25 uV
	EIA SINAD	0.35 uV	0.175 uV
SELECTIVITY (EIA SINAD)		-90 dB @±25 kHz	
EIA SINAD INTERMODULATION		-85 dB	-80 dB
SPURIOUS AND IMAGE REJECTION		100 dB minimum	
SQUELCH SENSITIVITY CARRIER SQUELCH (adjustable)		0.25 uV or less at threshold	0.125 uV or less at threshold
CODED SQUELCH (TONE OR DIGITAL)		0.25 uV or less	0.125 uV or less
DIGITAL-CODED SQUELCH		0.25 mV or less	0.125 uV or less
METERING		Optional receiver service kit used to measure all essential circuits for tuning and checking. A single scale, 0-50 microampere meter with 2,000 ohms equivalent series resistance or Motorola portable test set can be used to measure all circuits essential to tuning and checking.	
POWER REQUIREMENTS		Regulated 9.6 volts @100 mA 13.8 Volts @ 9.6 mA	

MOTOROLA INC. Communications Division
SERVICE PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60196

68P81026E38-C
6/12/81-UP

ELECTRICAL PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed, mica: unless otherwise specified, value is in pF
C101 thru 104	21Ds242aB59	.01 uF +80-20%, 200 V
C107	21Ds240aB06	0.75
C108L	21Ds610C99	30, 200 V; NPO
C108M	21Ds133G56	27; NPO
C108H	21Ds610C99	30, 200 V; NPO
C109HH	21Ds133G56	27; NPO
C109L	Z1-8340aD46	56; N150
C109M	Z1-8340aD44	47; N080
C109H	Z1-8340aD46	56; N150
C109HH	Z1-8340aD44	47; N080
C110L	Z1-83798B01	100
C110M	Z1-84494B03	80
C110H	Z1-83798B01	100
C110HH	Z1-84494B03	80
C111	21D8233G37	2 ±0.25 pF; NP0
C112	21Ds242aB59	.01 uF +80-20%, 200 V
C113L	21D83406D36	10 ±0.25 pF; NP0
C113M	21D82133G14	7.5 ±0.25 pF; NP0
C113H	21D83406D36	10 ±0.25 pF; NP0
C113HH	21D82133G14	7.5 ±0.25 pF; NP0
C114	21Ds139aE14	.002 uF ±10%; 200 V; Y5F
C115	21Ds240aB07	9.39
C116L	21D83406D36	10 ±0.25 pF; NP0
C116M	21D82133G14	7.5 ±0.25 pF; NP0
C116H	21D83406D36	10 ±0.25 pF; NP0
C116HH	21D82133G14	7.5 ±0.25 pF; NP0
C117	21Ds139aE14	.002 uF ±10%; 200 V; Y5F
C118	21Ds210C44	100; 100 V; NZ0
C119	21Ds242aB59	.01 uF +80-20%, 200 V
C120	21Ds242aB59	.01 uF +80-20%, 200 V
C121	21Ds242aB59	.01 uF +80-20%, 200 V
C122	21Ds213aG49	16; NP0
C123		NOT USED
C124	21D82450B05	9.24
C125	21K888487	1.5 ±0.25 pF; NP0
C126	21K888487	1.5 ±0.25 pF; NP0
C127	21D83406D57	13; NP0
C128	21D83406D55	18; NP0
C129	21D8242aB59	.01 uF +80-20%, 200 V
C130	21D8242aB59	.01 uF +80-20%, 200 V
C131	21D8242aB59	.01 uF +80-20%, 200 V
C132	21D8242aB59	.01 uF +80-20%, 200 V
C133	RD83131H06	0.1 uF ±10%
C134	21D84434B05	160
C135	21D83406D39	36; NP0
C136	21K888487	1.5 ±0.25 pF; NP0
C137	21K888487	1.5 ±0.25 pF; NP0
C138	21D82150B07	0.39
C139	21D8213aG15	15
C140	21D8213aG15	15
C141	21D8242aB59	.01 uF +80-20%, 200 V
C142	21D8242aB59	.01 uF +80-20%, 200 V
C143	23D3214aC02	15 uF ±20%, 25 V
C144	21D8476aJ04	2.2 uF ±20%, 25 V
C145	21D8242aB59	.01 uF +80-20%, 200 V
C146	21D8242aB59	.01 uF +80-20%, 200 V
C147	21D8242aB59	.01 uF +80-20%, 200 V
C148	21D8242aB55	.01 uF ±10%
C149	21D8213aG56	47; NP0
C150	21D8242aB59	.01 uF +80-20%, 200 V
C151	21D8379aB01	100; 200 V; NP0
C152	21D8379aB01	100; 200 V; NP0
C153	21D82187B35	470 ±10%
C154	21D8217B39	470 ±10%
C155	21D8242aB59	.01 uF +80-20%, 200 V
C156	23-84538C02	4.7 uF ±20%; 35 V
C157	21D8242aB59	.01 uF +80-20%, 200 V
C158	21D8476aJ10	2.2 uF ±20%; 25 V
C159	21D82187B07	470 ±10%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode: see table
CR101	48C82139C01	germanium
CR102	48C82139G01	germanium
CR103	48D84616A01	planar hot carrier
CR104	48D84616A01	planar hot carrier
CR105	48C84616A01	planar hot carrier
		INTEGRATED CIRCUIT
	51-84561L69	type, M6169
	51-84561L69	type, M6169
		CONNECTOR, receptacle:
	9Ch4207B01	female; 7 contact
	9Ch4135B01	female; single contact; phono type
		COIL, RF: unl stated
L101L	24Ds4070C01	input
L101M	24D84070C01	input
L101H	24D84409B01	input
L101HH	24D84409B01	input
L102L	24D84070C03	center
L102M	24D84070C03	center
L102H	24D84409B03	center
L102HH	24D84409B03	center
L103L	24D84070C03	center
L103M	24D84070C03	center
L103H	24D84409B03	center
L103HH	24D84409B03	center
L104L	24D84070C03	center
L104M	24D84070C03	center
L104H	24D84409B03	center
L104HH	24D84409B03	center
L105L	1V80713B52	output
L105M	1V80713B52	output
L105H	1V80709B36	output
L105HH	1V80709B36	output
L106	24E83879G08	IF (GRN)
L107	24-83879C04	discriminator (YEL)
L108	24D84115B03	multiplier (RED)
L109	24D84115B12	multiplier (BRN)
L110	24D83857G07	multiplier (YEL)
L111	24D83857G06	multiplier (VIO)
L112L	24C84411B02	choke; YEL
L112M	24C84411B02	choke; YEL
L112H	24C84411B02	choke; YEL
L112HH	24C84411B01	choke; WHT
L113	24D82549D25	choke; 10 uH (shielded)
L114	24D82549D24	choke; 15 uH (shielded)
L115	24D82723H07	choke; 10 uH (VIO)
L116	24D82723H09	choke; 6.2 uH (BLU)
L117	24D82549D24	choke; 15 uH (shielded)
L118	24D82723H07	choke; 10 uH (VIO)
L119	24D82723H07	choke; 10 uH (VIO)
L120	76B8396B01	choke; Ferrite bead
		TRANSISTOR: (SEE NOTE)
Q101	48R869943	N-Channel; FET M9943
Q102	48R869652	N-Channel; FET M9652
Q103	48R869658	N-P-N; M9658
		RESISTOR, fixed ±10%: 1/4 W unl, stated
R101	6S127807	33K
R102	6S124A60	3K ±5%
R103	6S129753	100
R104	6S127801	470
R105	6S128689	2.2K
R106	6S129753	100
R107L	6S129145	82K
R107M	6S127145	82K
R107H	6S129230	12K
R107HH	6S129230	12K
R108	6S127752	270
R109	6S127800	220
R110	6S129886	27K ±5%
R111	6S129467	22K ±5%
R112	6S129779	560 ±5%
R113	6S129467	22K ±5%
R114	6S129887	12K ±5%
R115	6S129236	15K ±5%
R116	6S129467	22K ±5%
R117	6S129779	560 ±5%
R118	6S129467	22K ±5%
R119	6-124A65	4.7K
R120	6S129755	10
R121	6S127807	33K

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R122L, 122M	6-124A77	10k ±5%
R122H, 122HH	6-124A77	15k ±5%
R123L, 123M	6-129236	15k ±5%
R123H, 123HH	6S129983	8.2K ±5%
R124	6S129226	100k
R125	6S128682	390k
R126	6S127805	1K
R127	6S129225	10k
		CRYSTAL, quartz
Y101	48D8441ZB01	11,700 kHz
Y102 thru 104	48D8441ZB03	11,700 kHz
Y105	48D8466B01	11,700 kHz

TLD8740A Shifted IF Crystal Kit PL-2384-O

		CRYSTAL UNIT, quartz: 11.8 MHz; 1-f filter
Y101 thru 104	48-84412B02	
Y105	48-84699B02	discriminator filter

MECHANICAL PARTS LIST

TLD8270B Series Receiver RF & IF Board PL-5170-p

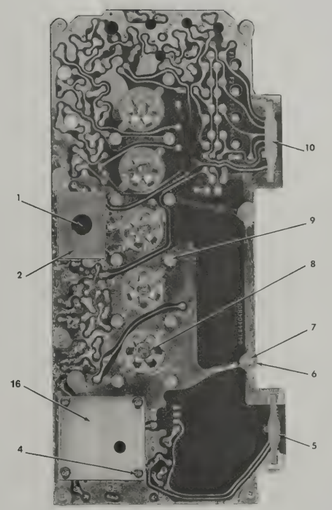
CODE	MOTOROLA PART NO.	DESCRIPTION
1	5B84644B01	GROMMET, rubber
2	26C84642B01	SHIELD (IF)
3	26B84413B01	SHIELD, (discriminator)
4	3S136398	SCREW, tapping: 4-24 x 1/2" (4 req'd)
5	55B84300B02	HANDLE (short)
6	42C86284B01	RETAINER, screw: 9 req'd
7	3S136905	LOCKSCREW: No. 4 x 5/16"; 9 req'd
8	41B84410B03 or 2-84773E03	NUT, screw tensioning: 5 req'd, NUT, screw tensioning: 5 req'd,
9	3S135084	LOCKSCREW: No. 4 x 5/16"; 12 req'd,
10	55B84300B01	HANDLE (long); 2 req'd
11	29C84028H01	CONTACT, male; 16 req'd
12	26B84250B05	SHIELD, 4 req'd
13	39S10184A24	CONTACT, female
14	26B84250B06	SHIELD
15	14B84540B01	INSULATOR (crystal) 4 req'd
16	26B84414B01	SHIELD, bottom
17	26B84250B08	SHIELD
18	26C84415B01	SHIELD, spring
19	14A84583B01	INSULATOR (crystal)
20	4A49854	WASHER, spacer: 2 req'd
21	26B84643B01	SHIELD, barrier
22	39S10184A30	CONTACT
23	29K855943	CONTACT, male; 20 req'd
24	15D84408B01	COVER, RF deck
25	3S134189	LOCKSCREW: No. 4 x 1/4" 12 req'd
26	15D84407B01	HOUSING, RF deck
27	3S136926	LOCKSCREW: No. 4-40 x 5/16" 10 req'd,
28	5B84220B01	GROMMET, "Nylon"; 4 req'd

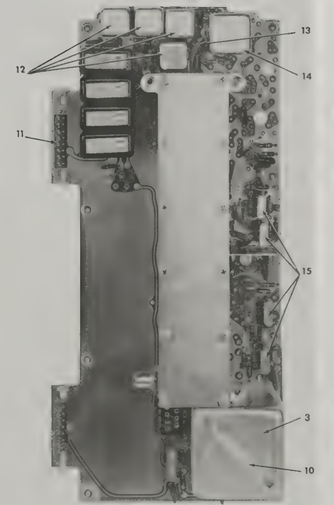
NOTE:

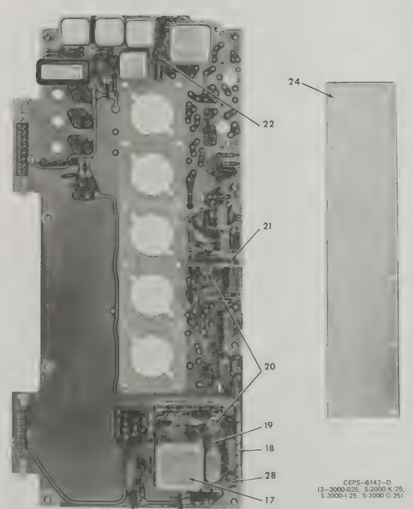
Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

Channel Element PL-2904-O

	K1005A	Receiver control; 132-174 MHz







CEPS-6147-D
(3-3000-625, 5-3000 K-25, 5-3000-25, 5-3000 G-25)

"MICOR" "SENSITRON"
UHF RECEIVER RF & IF BOARD
MODELS TRE1201BA, 1203BA, 1204BA, 1205BA

MODEL TABLE

MODEL	FREQUENCY RANGE (MHz)
TRE1201BA	406-420
TRE1203BA	450-470
TRE1204BA	470-494
TRE1205BA	494-512

TECHNICAL CHARACTERISTICS

CHANNEL SPACING		25 kHz	
EIA MODULATION ACCEPTANCE		±7 kHz minimum	
FREQUENCY STABILITY		AFC channel element maintains receiver frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient temperature (+25°C reference).	
INPUT IMPEDANCE		50 ohms	
SENSITIVITY	20 DB QUIETING	NO PREAMPLIFIER: 0.5 uV	WITH PREAMPLIFIER: 0.25 uV
	EIA SINAD	0.35 uV	0.175 uV
SELECTIVITY (EIA SINAD)		-90 dB @±25 kHz	
EIA SINAD INTERMODULATION		-85 dB	-80 dB
SPURIOUS AND IMAGE REJECTION		100 dB minimum	
SQUELCH SENSITIVITY CARRIER SQUELCH (adjustable)		0.25 uV or less at threshold	0.125 uV or less at threshold
CODED SQUELCH (TONE OR DIGITAL)		0.25 uV or less	0.125 uV or less
DIGITAL-CODED SQUELCH		0.25 mV or less	0.125 uV or less
METERING		Optional receiver service kit used to measure all essential circuits for tuning and checking. A single scale, 0-50 microampere meter with 2,000 ohms equivalent series resistance or Motorola portable test set can be used to measure all circuits essential to tuning and checking.	
POWER REQUIREMENTS		Regulated 9.6 volts @100 mA 13.8 Volts @ 9.6 mA	

MOTOROLA INC. Communications Division
SERVICE PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60196

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MAINTENANCE

1. RECEIVER RF & IF BOARD

1.1 INTRODUCTION

This section provides maintenance procedures for the receiver rf and i-f board. These procedures consist of tests which include metering measurements and testing and troubleshooting procedures that include integrated circuit checks.

NOTE

The receiver rf and i-f board must be installed in a receiver for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation and testing to provide a good rf ground to all stages of the receiver. The board may be installed in the receiver or a "Micor" mobile radio set for testing.

1.2 PERFORMANCE TESTS

Use the following tests to determine if the receiver rf and i-f board is operating properly. If either of the tests produces unsatisfactory results, refer to the receiver rf and i-f troubleshooting chart for a procedure to isolate the defective stage.

1.2.1 No-Signal Meter Reading Check

1.2.1.1 General

1.2.1.1.1 A failure in almost any part of the rf and i-f board will result in an improper meter reading in one or more of the test positions. Improper alignment will also cause improper meter readings.

1.2.1.1.2 Compare the current readings observed in positions 1 through 5 with those in the following table. A low reading on meter position 1 indicates a defective channel element. A low reading on meter positions 2 or 3 indicates a defective multiplier circuit. Improper meter 4 or 5 readings indicate a malfunction elsewhere in the receiver; check rf and i-f voltages per the schematic diagram to isolate the malfunction.

MINIMUM RECEIVER RF & IF METER READINGS TABLE
(No Input Signal Applied)

SELECTOR SWITCH POSITION	READING (MICRO-AMPS)	CIRCUIT METERED
1	15	Channel element output
2	15	First Doubler output
3	15	Second Doubler output
4+, 4-	0 ±2	Discriminator output
5	10	Second i-f amplifier and limiter

1.2.1.2 Input Voltages

1.2.1.2.1 If there are no test set indications at one or more of the metered points, check the dc input voltages to the receiver rf and i-f circuit board.

P904-9	A+ continuous (+13.8 V dc with reference to chassis)
P904-11	9.6 V dc continuous (with reference to chassis) (±0.5 V)
P904-8	9.6 V dc continuous (with reference to chassis) (±0.5 V)

1.2.1.2.2 If test set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

1.2.1.3 Using the Portable Test Set

NOTE

J101 can accommodate only the built-in metering set or the portable test set, but not both simultaneously. Plugging a portable test set in a receiver with built-in metering will disconnect the built-in metering cable.

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver.

Step 4. Using a TEK-37 Adapter Cable, connect a Motorola portable test set or meter panel to the station as follows:

--Connect the adapter cable 20-in connector to the receptacle on the front of the test set or meter panel.

--Connect the adapter cable 7-pin white "metering" plug to the metering receptacle on the receiver rf and i-f board.

Step 5. Set the portable test set switches as follows:

--Set the function switch to the RCVR position.

--Set the meter reversing switch to the OFF position.

--Set the adapter cable SENS switch to the 100 mV position. If the adapter cable has no SENS switch, the unit operates at 100 mV all of the time.

--Set the adapter cable reference switch to position A or position B.

Step 6. Refer to the meter reading table in paragraph 1.2.1. Set the test set selector switch to the positions called for in the table and observe the test set meter. Notice that the meter readings given in the table are minimums.

1.2.1.4 Using Built-In Receiver Metering

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the station.

Step 4. Plug the receiver service kit into the station.

NOTE

The receiver service kit will not operate unless the TKN6759A Cable Kit has been installed in the receiver.

It is not necessary to turn the metering POWER switch on. The switch should only be in the "on" position when the METER SELECTOR switch is set on position 6.

Step 5. Refer to the meter reading table in paragraph 1.2.1. Set the meter selector switch to the positions called for in the table and observe the meter. Notice that the meter readings given in the table are minimums.

1.2.2 20 dB Quieting Sensitivity Test

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service. The receiver shield must be in place while performing this test.

1.2.2.1 Using An AC Voltmeter And Portable Test Set

Step 1. Perform steps 1 thru 5 in paragraph 1.2.1.3.

Step 2. Connect an ac voltmeter across pins 1 and 18 of the audio control module.

Step 3. (PL receivers only) Disable PL, using the switch on the PL module.

Step 4. Set the receiver squelch control fully counterclockwise (unsquelched).

Step 5. Adjust the LINE LEVEL control so the ac voltmeter reads 565 mV ac.

Step 6. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until test set meter position 4 reads exactly zero.

Step 7. Slowly decrease the signal generator output level until the ac voltmeter reads 56.5 mV ac (20 dB down from 565 mV ac). Switch to a lower voltmeter scale if necessary.

NOTE

The output frequency of some signal generators will be "pulled" when the output level is near maximum. It may be necessary to reset the generator frequency to zero meter 4 as the output level is reduced.

Step 8. Note the signal generator output level. If the receiver rf and i-f board is functioning properly, this level should be 0.5 uV or less for a receiver without an rf preamplifier, or 0.25 uV or less for a receiver with an rf preamplifier.

Step 9. Readjust the LINE LEVEL control as described in the MAINTENANCE Section of the manual.

1.2.2.2 Using Built-In Receiver Metering

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver. Turn metering on.

Step 4. Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" stations must also be PL disabled.

Step 5. Set meter selector switch to POS 6 and the speaker sw to the "off" POS. Adjust the LINE LEVEL control for 50 uA as indicated on the meter.

Step 6. Connect an rf signal generator to the receiver input connector.

Step 7. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until meter position 4 reads exactly zero.

Step 8. Slowly decrease the signal generator output level until METER POS 6 reads 5 uA.

NOTE

The output frequency of some signal generators will be "pulled" when the output level is near maximum. It may be necessary to reset the generator frequency to zero meter 4 as the output level is reduced.

Step 9. Note the signal generator output level. If the receiver rf and i-f board is functioning properly, this level should be 0.5 uV or less for a receiver without an rf preamplifier, or 0.25 uV or less for a receiver with an rf preamplifier.

Step 10. Readjust the LINE LEVEL control as described in the MAINTENANCE section of the manual.

1.3 TROUBLESHOOTING

1.3.1 Visual Inspection

1.3.1.1 The first step in the troubleshooting procedure should be a thorough visual inspection of the receiver and, in particular, the receiver rf and i-f board. Corrosion and burned or damaged components are usually easily seen and may be the cause or a symptom of the receiver malfunction. Loose circuit board mounting screws, or a loose or improperly installed receiver shield are other easily found problems that can cause a considerable degradation in receiver performance.

1.3.1.2 After the "obvious" problems have been corrected, repeat the receiver rf and i-f board performance tests. If the tests still produce unsatisfactory results, refer to the receiver rf and i-f troubleshooting chart. The troubleshooting chart provides a systematic procedure for isolation of the defective stage and component.

1.3.1.3 As much information as possible has been included on the troubleshooting chart. However, you will have to refer occassionally to the receiver rf and i-f schematic diagram and circuit board detail. Detailed procedures regarding alignment, integrated circuits, and AFC troubleshooting, receiver gain measurements, and crystal dip tests follow in the text of this section of the manual.

1.3.2 Alignment as a Troubleshooting Technique

Low test set readings, improper discriminator output, and otherwise abnormal performance are very often corrected by realignment. Therefore, alignment should be one of the first troubleshooting steps performed for these symptoms.

1.3.3 Troubleshooting Integrated Circuits

The ICs on the receiver rf and i-f board may be checked by dc voltage measurements. Proper voltages are shown in the following table.

NOMINAL RECEIVER INTEGRATED CIRCUIT DC VOLTAGES

(All readings are in volts dc, measured with respect to chassis)

PIN NO.	IC101 VOLTAGE	IC102 VOLTAGE
1	GND	2.8
2	GND	GND
3	2.8	2.8
4	6.6	6.6
5	9.3	9.3
6	7.2	7.2
7	6.4	6.4
8	2.8	2.8
9	2.8	2.8
10	GND	GND

NOTE: All voltages may vary ±10% from nominal readings shown.

Step 1. Refer to the following table of receiver gain measurements, the receiver rf and i-f schematic diagram, and the receiver rf and i-f circuit board detail.

NOTE

Receiver rf input voltages given in the table are those at the receiver input connector. If a pad or other attenuator is connected between the signal generator and the receiver rf input, the signal generator output control must be set to compensate for the loss in the pad.

EXAMPLES:
6 dB loss means V out of the pad = 1/2 V into the pad.

20 dB loss means V out of the pad = 1/10 V into the pad.

RECEIVER GAIN MEASUREMENTS

TEST POINT (See rf & i-f circuit board detail)	RECEIVER INPUT VOLTAGE (preset)	TEST POINT VOLTAGE ±6 dB	REMARKS
A	16 mV	100 mV	
B	8 mV	50 mV	
C	10 mV	50 mV	
D	15 mV	50 mV	
E	12 mV	50 mV	
F	15 mV	50 mV	
G	10 mV	600 mV	IC101 saturated output
H	6 uV	100 mV	
I	9 uV	100 mV	
J	12 uV	100 mV	
K	11 uV	100 mV	
L	20 uV	100 mV	
M	1 uV	750 mV	IC102 saturated output

Step 3. Set the signal generator output frequency to the receiver channel frequency ("0" reading on meter 4). Adjust the signal generator output to provide the required receiver input voltage for a particular test point as listed in the table. Then, using an rf voltmeter, measure the rf signal voltage between the test point and a nearby chassis ground point. At every test point the measured voltage should be within ±6 dB of the value given in the table.

Step 4. A high or low test point voltage measurement may indicate that the crystal at or ahead of the test point is defective. However, it may also indicate that an associated circuit component is defective. The extremely high-Q crystals used are very sensitive to associated circuit components. For example, if L125 is defective, it might appear that Y102 is bad. To isolate the defective component, perform the crystal dip tests described in the following procedure.

1.3.6 Crystal Dip Test

1.3.6.1 A defective crystal in the i-f selectivity portion of the receiver can be located by measuring receiver gain voltages and performing crystal dip tests.

CRYSTAL DIP FREQUENCIES

CRYSTAL	TEST POINT GROUNDED	TEST POINT MONITORED	+ FREQUENCY DIP (kHz) ±2.5 kHz	- FREQUENCY DIP (kHz) ±2.5 kHz
Y101	C	B	6.0	7.0
Y102	E	D	6.5	6.5
Y103	I	H	6.0	7.0
Y104	K	J	6.5	6.5

1.3.6.2 The monolithic crystals used in "Micor" receivers are made up of two separate resonators on a single quartz blank. Each crystal has a pair of characteristic operating frequencies. One way to find the characteristic frequencies of each crystal is to short the crystal output to chassis ground, then monitor the crystal input voltage with an rf voltmeter while varying the signal generator frequency across the bandpass of the receiver. Low voltage points will occur at each of the crystal characteristic frequencies.

1.3.6.3 Figures 1 and 2 (on back of schematic diagram) are plots of typical rf voltmeter readings obtained while testing good crystals. Note that the horizontal scales are calibrated in frequency, with f_o the channel frequency of the receiver. The vertical scales represent relative rf voltmeter readings. The bottom line is zero and the top line is maximum. Notice that each plot has a sharp minimum point above f_o and another below f_o. The table of crystal dip frequencies lists the frequencies at which these dip points should appear. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective.

Step 1. Leave the test equipment set up as was done for the receiver gain measurements.

Step 2. Set the signal generator to f_o, the receiver channel frequency ("0" on meter 4). Adjust the generator output control for at least 50 mV at the receiver input connector.

Step 3. Refer to the crystal dip frequency table. To test a particular crystal, find it in the table, ground the indicated test point, and connect an rf voltmeter between the monitored test point and a nearby chassis ground point.

Step 4. Starting at f_o, slowly increase the signal generator frequency while watching for a dip in the rf voltmeter reading. This dip should be sharp, so increase the signal generator frequency very slowly and watch the rf voltmeter closely. When the dip is found, write down the frequency counter reading.

Step 5. Return the signal generator to f_o. Then watch the rf voltmeter while slowly decreasing the signal generator frequency. When the dip is found, write down the frequency counter reading.

Step 6. Compare your test results with the frequencies and tolerances listed in the table for the crystal you have tested. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective. Continue with this procedure to isolate the bad component.

Step 7. FOR TEST PURPOSES ONLY, exchange the suspected crystal with another from the receiver. Be sure you note the polarity of the crystal when you make the change. Repeat the receiver gain measurement and crystal dip test on the suspected crystal in the new location. If the suspected crystal tests bad again, consider it defective and replace it. If the crystal tests good, look for defective associated components at the original crystal location.

Step 8. When the tests are completed, be sure all jumpers connected during the test are removed and that any moved crystals are returned to their original locations. Refer to the parts list and circuit board detail for correct part location. Note crystal polarity when replacing crystals.

1.3.7 Field Conversion to Shifted IF

A standard 11.7 MHz i-f receiver can easily be converted to operate at the shifted i-f of 11.8 MHz. Replace crystal filters Y101 through Y105 with the 11.8 MHz parts; refer to the parts list for the TLE8610A Shifted IF Crystal Kit for the part numbers. Finally, replace the channel element, using the 11.8 MHz i-f formula for calculating the crystal frequency.

METER POSITION	STAGE AND PROCEDURE
5*	Preamplifier - If the receiver is equipped with the optional preamplifier, reconnect the preamplifier. Tune C1 and C2 for maximum meter 5 reading. Then tune C1, C2, and L111 for best noise quieting on the ac voltmeter.
	Perform 20 dB quieting sensitivity measurement as check of alignment. Refer to the following Receiver Maintenance information which describes how to check 20 dB quieting sensitivity. The 20 dB quieting level should be less than .5 uV (.25 uV with preamplifier).

ice kit is not used, connect an ac voltmeter across pins 1 and 18 of the

amplifier
rough L105 uit board.
L106 y extends ver shield.
01 and L102 n on meter
ing on 3.
n meter 3. h coils
ne L103 t below .

CRYSTAL DIP FREQUENCIES

CRYSTAL	TEST POINT GROUNDED	TEST POINT MONITORED	+ FREQUENCY DIP (kHz) ±2.5 kHz	- FREQUENCY DIP (kHz) ±2.5 kHz
Y101	C	B	6.0	7.0
Y102	E	D	6.5	6.5
Y103	I	H	6.0	7.0
Y104	K	J	6.5	6.5

1.3.6.2 The monolithic crystals used in "Micor" receivers are made up of two separate resonators on a single quartz blank. Each crystal has a pair of characteristic operating frequencies. One way to find the characteristic frequencies of each crystal is to short the crystal output to chassis ground, then monitor the crystal input voltage with an rf voltmeter while varying the signal generator frequency across the bandpass of the receiver. Low voltage points will occur at each of the crystal characteristic frequencies.

1.3.6.3 Figures 1 and 2 (on back of schematic diagram) are plots of typical rf voltmeter readings obtained while testing good crystals. Note that the horizontal scales are calibrated in frequency, with f_o the channel frequency of the receiver. The vertical scales represent relative rf voltmeter readings. The bottom line is zero and the top line is maximum. Notice that each plot has a sharp minimum point above f_o and another below f_o. The table of crystal dip frequencies lists the frequencies at which these dip points should appear. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective.

Step 1. Leave the test equipment set up as was done for the receiver gain measurements.

Step 2. Set the signal generator to f_o, the receiver channel frequency ("0" on meter 4). Adjust the generator output control for at least 50 mV at the receiver input connector.

Step 3. Refer to the crystal dip frequency table. To test a particular crystal, find it in the table, ground the indicated test point, and connect an rf voltmeter between the monitored test point and a nearby chassis ground point.

Step 4. Starting at f_o, slowly increase the signal generator frequency while watching for a dip in the rf voltmeter reading. This dip should be sharp, so increase the signal generator frequency very slowly and watch the rf voltmeter closely. When the dip is found, write down the frequency counter reading.

Step 5. Return the signal generator to f_o. Then watch the rf voltmeter while slowly decreasing the signal generator frequency. When the dip is found, write down the frequency counter reading.

Step 6. Compare your test results with the frequencies and tolerances listed in the table for the crystal you have tested. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective. Continue with this procedure to isolate the bad component.

Step 7. FOR TEST PURPOSES ONLY, exchange the suspected crystal with another from the receiver. Be sure you note the polarity of the crystal when you make the change. Repeat the receiver gain measurement and crystal dip test on the suspected crystal in the new location. If the suspected crystal tests bad again, consider it defective and replace it. If the crystal tests good, look for defective associated components at the original crystal location.

Step 8. When the tests are completed, be sure all jumpers connected during the test are removed and that any moved crystals are returned to their original locations. Refer to the parts list and circuit board detail for correct part location. Note crystal polarity when replacing crystals.

1.3.7 Field Conversion to Shifted IF

A standard 11.7 MHz i-f receiver can easily be converted to operate at the shifted i-f of 11.8 MHz. Replace crystal filters Y101 through Y105 with the 11.8 MHz parts; refer to the parts list for the TLE8610A Shifted IF Crystal Kit for the part numbers. Finally, replace the channel element, using the 11.8 MHz i-f formula for calculating the crystal frequency.

ALIGNMENT

1. MULTI-RECEIVER SITES

The four-receiver coupler and eight receiver coupler used to connect several receivers to an antenna do not require alignment. Align each receiver while disconnected from the coupler. Inject signal generator output into each receiver at the rf preselector (or preamp) and align. The reconnect the coupler and check for proper operation.

2. FREQUENCY CALCULATIONS

$$f_c = \frac{24 f_o + 11.7 \text{ MHz}}{24} \quad \text{or} \quad f_c = \frac{24 f_o + 11.8 \text{ MHz}}{24}$$

$$f_o = \frac{f_c - 11.7 \text{ MHz}}{24} \quad \text{or} \quad f_o = \frac{f_c - 11.8 \text{ MHz}}{24}$$

Where: f_c = carrier frequency

f_o = channel element frequency

11.7 MHz = Mixer output frequency (i-f)

11.8 MHz = Mixer output frequency (i-f shifted)

24 = channel element harmonic

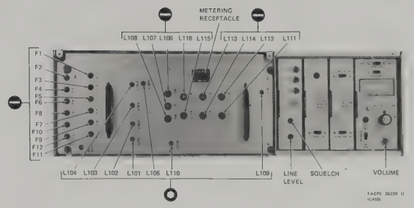
The receiver i-f is factory shifted from 11.7 MHz to 11.8 MHz when the difference between received carrier (channel spacing) frequencies is:

11.7 MHz ±25 kHz

5.85 MHz ±25 kHz

3.90 MHz ±25 kHz

2.925 MHz ±25 kHz



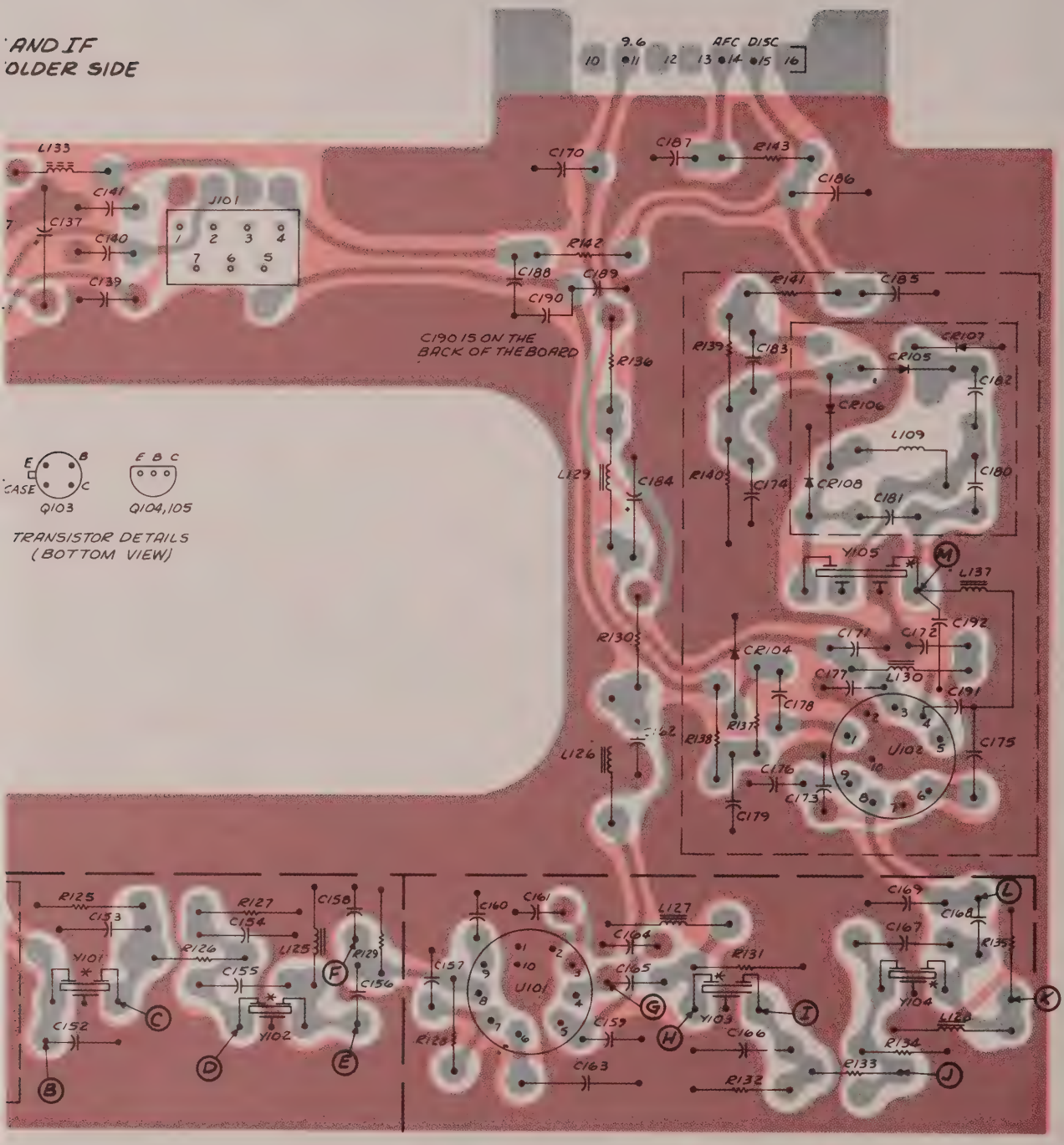
Receiver Adjustment Locations

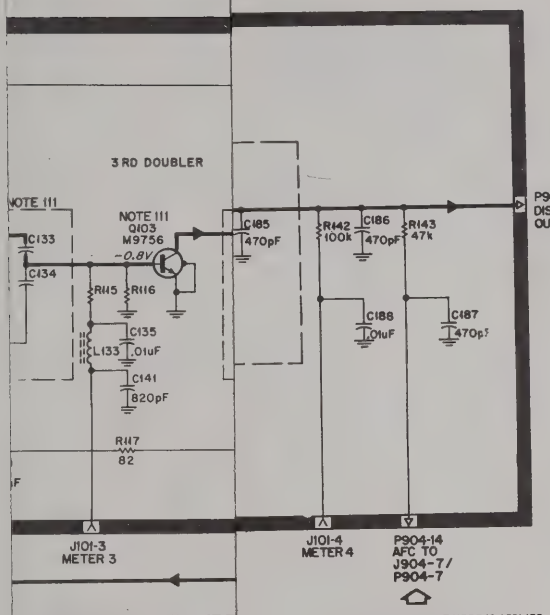
3. RECEIVER ALIGNMENT (RF & IF BOARD)

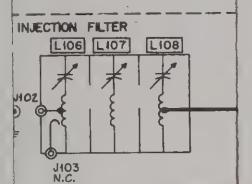
NOTE:
This procedure includes optional rf preamplifier alignment details. If an optional rf preamplifier is not used, simply disregard preamplifier-identified steps in the procedure.

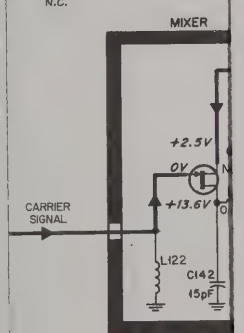
STEP	ADJUSTMENT	METER POSITION	STAGE AND PROCEDURE
1	L101, L102, L103, L104, L105	-	Multiplier Coils - Adjust the cores of L101 through L105 to the end of the coil form away from the circuit board.
2	L106, L107, L108	-	Injection Filter - Adjust the tuning screws for L106 through L108 until the top of each tuning screw extends approximately one-eighth inch below the receiver shield.
3	L101, L102	1	Channel Element Output - Alternately tune L101 and L102 CCW two turns at a time until a peak indication on meter 1 is obtained.
4	L103, L104	2	First Doubler - Tune L103 CCW for peak reading on meter 2. Tune L104 CCW for a dip on meter 3.
5	L105, L104	3	Second Doubler - Tune L105 CCW for a peak on meter 3. Tune L104 for a peak on meter 3. Repeak both coils until no further improvement can be obtained.
6	L101, L103	3	Detune L101 until meter 3 drops to 10 uA. Tune L103 for peak reading on meter 3, keeping this peak below 12 uA by farther detuning of L101 if necessary.
7	L101, L102	1	Alternately tune L101 and L102 for peak reading on meter 1 until no further improvement can be obtained.
8	L106, L107, L108	3	Injection Filter - Tune L106 for a dip on meter 3. Tune L107 for a peak reading on meter 3. Tune L108 for a dip on meter 3. Do not repeat.
9	L109	4, 5	Discriminator - Insert 11.7 MHz injection probe of the test set into L110 hole on receiver shield. Be careful not to contact the circuit board. Set METER REV switch to position A or B for this step and be sure that the test set is equipped with an 11.7 MHz crystal in the corresponding A or B socket. Insert the injection probe far enouth to obtain a saturated reading on meter 5. It should be possible to obtain readings on either side of zero (center) on meter 4 by tuning L109. Tune L109 for an EXACT zero reading on meter 4. This adjustment is critical.
10	L110, L111, L112, L113, L114, L115, L116	4, 5	RF Preselector and Mixer - Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. Disable the PL decoder by switching the PL monitor switch on the STATION CONTROL MODULE to the DISABLE position. Connect an rf signal generator to the receiver input connector and set the rf output of the generator to maximum. NOTE If the receiver frequency has been changed by more than 1 MHz, preset tuning screws L111 through L116 so that the screw end is in the space between the board and its shield, and approximately one-eighth inch from the shield. If the receiver is equipped with the optional preamplifier, disconnect and bypass the preamplifier. Set the generator to the carrier frequency by observing meters 4 and 5. NOTE If no indication is seen, unscrew the shell of the antenna cable connector, and pull the plug partially out of the jack so that the cable shield no longer makes contact with the station chassis. Set the generator to the carrier frequency as indicated by meter positions 4 and 5, then reconnect the cable shield to the radio. Adjust L111 through L116 clockwise one turn at a time, watching meter 5 for an increase in indication above noise level. Tune L111 through L116 for peak reading on meter 5, reducing generator output level as necessary to keep meter 5 out of saturation. Tune L110 for peak on meter 5. Repeat the adjust of L111 through L116. Turn L111 through L116 in or out as necessary until all screws are level. Repeat the adjustment of L111 through L116.
11	L106, L107 L108	6v	Tune L106, L107 and L108 for best noise quieting (minimum meter indication). Maximum meter sensitivity may be obtained by placing the multiplier switch meter on a low scale.
12	L111, L112, L113, L114, L115, L116	*	Tune L111 through L116 for best noise quieting. Repeat until no further improvement in quieting level can be obtained.
13	C1, C2, L111	5	Preamplifier - If the receiver is equipped with the optional preamplifier, reconnect the preamplifier. Tune C1 and C2 for maximum meter 5 reading. Then tune C1, C2, and L111 for best noise quieting on the ac voltmeter.
14			Perform 20 dB quieting sensitivity measurement as check of alignment. Refer to the following Receiver Maintenance information which describes how to check 20 dB quieting sensitivity. The 20 dB quieting level should be less than .5 uV (.25 uV with preamplifier).

*If built-in receiver service kit is not used, connect an ac voltmeter across pins 1 and 18 of the Audio Control Module.


AND IF
OLDER SIDE
9.6
AFC DISC
10 11 12 13 14 15 16
L133
C141
C137
C140
C139
J101
1 2 3 4
7 6 5
C170
C187
R143
C186
R142
C188
C189
C190
C190 IS ON THE BACK OF THE BOARD
R141
C185
R139
C183
CR107
CR105
C182
CR106
L109
C180
R140
C174
CR108
C181
L129
C184
R136
Y105
M
L137
C192
C171
C172
R130
CR104
C177
L130
C178
C191
R137
R138
C162
L126
C176
C173
C179
C175
U102
E B C
CASE
Q103
Q104,105
TRANSISTOR DETAILS
(BOTTOM VIEW)
R125
C153
R127
C154
C158
R126
L125
R129
Y101
C155
C156
C152
Y102
B
C
D
E
F
C160
C161
L127
C164
C157
U101
C165
G
H
I
R131
Y103
C166
C159
R128
C163
R132
C169
C168
L
C167
R135
Y104
L128
R134
R133
J
K
OL-EEPS-17033-C
COMPONENT SIDE
SOLDER SIDE
BD-EEPS-17031-0







REC

SENSITIVITY
SELECTIVITY
INTERMODUL
SPURIOUS AN
REJECTION
SQUELCH SEN

RECEIVER RF & IF NOTES

101. FREQUENCY CALCULATION:

$f_c = 24\, f_o + 11.7$ MHz or $f_c = 24\, f_o + 11.8$ MHz

$f_o = \frac{f_c - 11.7\text{ MHz}}{24}$ or $f_o = \frac{f_c - 11.8\text{ MHz}}{24}$

WHERE: f_c = CARRIER FREQUENCY
f_o = CHANNEL ELEMENT FREQUENCY
11.7 MHz = MIXER OUTPUT FREQUENCY (I–F)
11.8 MHz = MIXER OUTPUT FREQUENCY (I–F SHIFTED)
24 = CHANNEL ELEMENT HARMONIC

THE RECEIVER I–F IS FACTORY SHIFTED FROM 11.7 MHz TO 11.8 MHz WHEN THE DIFFERENCE BETWEEN RECEIVED CARRIER (CHANNEL SPACING) FREQUENCIES IS:

11.7 MHz ± 25 kHz
5.85 MHz ± 25 kHz
3.90 MHz ± 25 kHz
2.925 MHz ± 25 kHz

102. DASHED LINES REPRESENT SHIELDING.
103. INDEX DOT ON Y105 CRYSTAL CAN INDICATES PHYSICAL ORIENTATION REQUIRED.
104. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN PICOFARADS. RESISTOR VALUES ARE IN OHMS.
105. RF VOLTAGES TAKEN WITH MOTOROLA SOLID–STATE DC MULTIMETER WITH PLUG–IN RF PROBE.
106. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER IN RESPECT TO CHASSIS GROUND.
107. DC VOLTAGE IS FUNCTION OF SIGNAL LEVEL.
108. CIRCUITRY ASSOCIATED WITH CHANNEL ELEMENTS F5–F12 (CAPACITORS AND CHANNEL ELEMENT SOCKETS) ARE PRESENT ON THIS BOARD BUT NOT FUNCTIONAL.
109. JU101 IS ALWAYS OUT. L117 IS PRESENT ON THE CIRCUIT BOARD BUT NOT FUNCTIONAL IN THIS APPLICATION.
110. R144 MUST BE USED WITH RF DECK MODELS TLE8023A, TLE8024A AND TLE8025A SUFFIX –1 OR LATER, AND WITH TLE8021A (NO SUFFIX).
111. VALUE DEPENDS ON FREQUENCY RANGE OF RADIO SET. SEE COMPONENT VALUE TABLE ON THIS PAGE.
112. THE TWO–RECEIVER COUPLER MOUNTS IN THE RECEIVER SECTION OF THE UNIFIED CHASSIS AND MAY OR MAY NOT BE USED WITH OPTIONAL RF PREAMPLIFIERS. WITH NO PREAMPLIFIER, THE COUPLER CONNECTS BETWEEN THE ANTENNA SWITCH AND BOTH RECEIVERS. WITH ONE PREAMPLIFIER, THE COUPLER CONNECTS BETWEEN THE PREAMPLIFIER AND BOTH RECEIVERS. WITH TWO PREAMPLIFIERS, THE COUPLER CONNECTS BETWEEN THE ANTENNA SWITCH AND BOTH PREAMPLIFIERS. THE TWO-RECEIVER IS NOT USED IN TAC APPLICATIONS.

LEGEND:

START - CIRCUIT THEORY MOST EASILY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW.

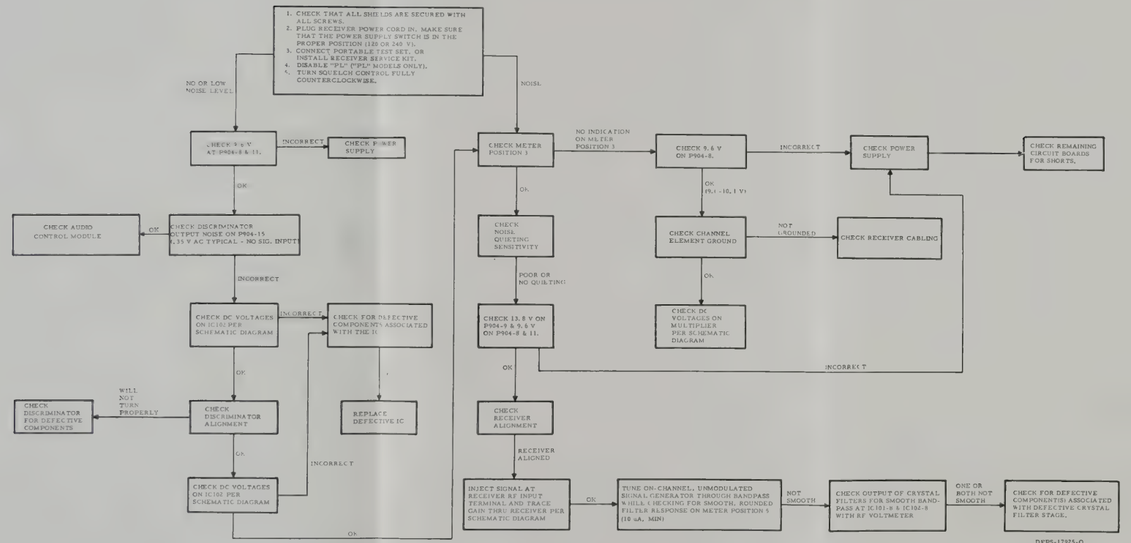
= THEORY OF OPERATION DATA

= MAINTENANCE DATA

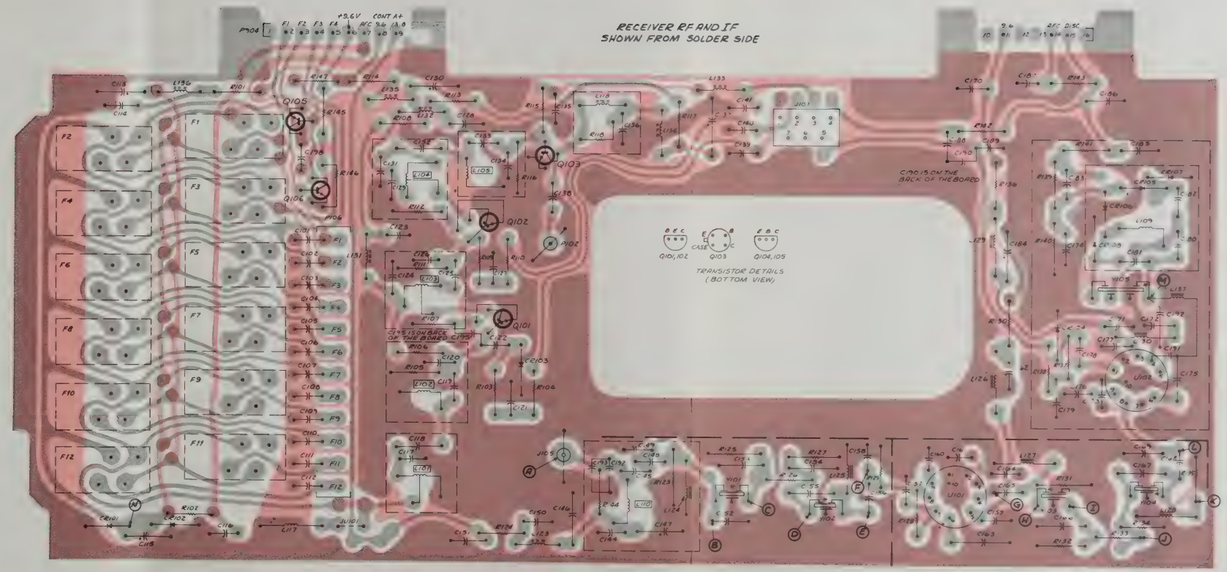
= PRIMARY SIGNAL FLOW

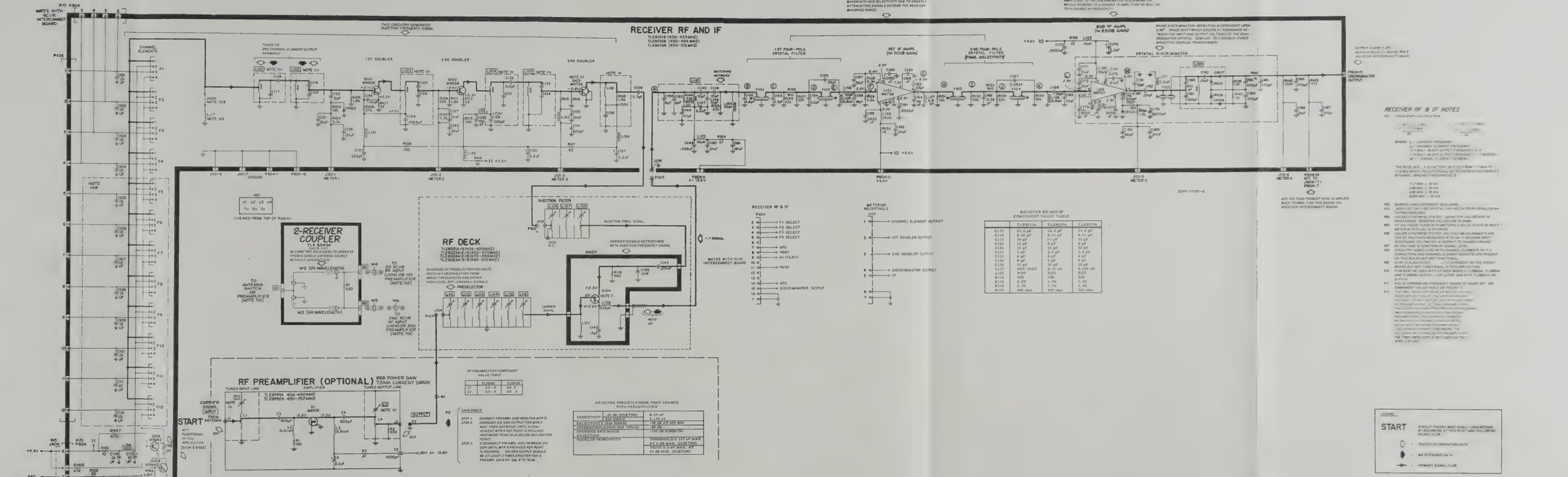
TLE8030A RF & I-F Board
Schematic Diagram
Motorola No. EEPS-17185-B
7/15/81- UP

RECEIVER RF & IF CIRCUIT BOARD TROUBLESHOOTING CHART


1. CHECK THAT ALL SHIELDS ARE SECURED WITH ALL SCREWS.
2. PLUG RECEIVER POWER CORD IN, MAKE SURE THAT THE POWER SUPPLY SWITCH IS IN THE PROPER POSITION (120 OR 240 V).
3. CONNECT PORTABLE TEST SET, OR INSTALL RECEIVER SERVICE KIT.
4. DISABLE "PLL" ("PLL" MODELS ONLY).
5. TURN SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
NO OR LOW NOISE LEVEL
NOISE
CHECK 9 & V AT P904-8 & 11.
INCORRECT
CHECK POWER SUPPLY
OK
CHECK AUDIO CONTROL MODULE
OK
CHECK DISCRIMINATOR OUTPUT NOISE ON P904-15 4.35 V AC TYPICAL - NO SIG. INPUT
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
INCORRECT
CHECK FOR DEFECTIVE COMPONENT(S) ASSOCIATED WITH THE IC
OK
WILL NOT TUNE PROPERLY
CHECK DISCRIMINATOR FOR DEFECTIVE COMPONENTS
CHECK DISCRIMINATOR ALIGNMENT
REPLACE DEFECTIVE IC
OK
INCORRECT
CHECK DC VOLTAGES ON IC102 PER SCHEMATIC DIAGRAM
OK
CHECK METER POSITION 3
NO INDICATION ON METER POSITION 3
OK
CHECK NOISE QUIETING SENSITIVITY
POOR OR NO QUIETING
CHECK 13.8 V ON P904-9 & 9.6 V ON P904-8 & 11.
OK
CHECK RECEIVER ALIGNMENT
RECEIVER ALIGNED
INJECT SIGNAL AT RECEIVER RF INPUT TERMINAL AND TRACE GAIN THRU RECEIVER PER SCHEMATIC DIAGRAM
OK
TUNE ON-CHANNEL, UNMODULATED SIGNAL GENERATOR THROUGH BANDPASS 'N HILL & HECKING FOR SMOOTH, ROUNDED FILTER RESPONSE ON METER POSITION 5 (10 uA, MIN)
NOT SMOOTH
CHECK OUTPUT OF CRYSTAL FILTERS FOR SMOOTH BAND-PASS AT IC101-8 & IC102-8 WITH RF VOLTMETER
ONE OR BOTH NOT SMOOTH
CHECK FOR DEFECTIVE COMPONENT(S) ASSOCIATED WITH DEFECTIVE CRYSTAL FILTER STAGE.
CHECK 9 & V ON P904-8.
INCORRECT
CHECK POWER SUPPLY
CHECK REMAINING CIRCUIT BOARDS FOR SHORTS.
OK
CHECK CHANNEL ELEMENT GROUND
NOT GROUNDED
CHECK RECEIVER CABLING
OK
CHECK DC VOLTAGES ON MULTIPLIER PER SCHEMATIC DIAGRAM
INCORRECT
DEPS-17925-O

Receiver RF & I-F Troubleshooting Chart and
Circuit Board Detail
Motorola No. PEPS-17924-O
7/15/81- UP




RECEIVER RF AND IF
RF DECK
2-RECEIVER COUPLER
RF PREAMPLIFIER (OPTIONAL)
RECEIVER RF & IF NOTES
TLE8030A RF & I-F Board
Schematic Diagram
Motorola No. EEPS-1718--B
7/15/81- UP

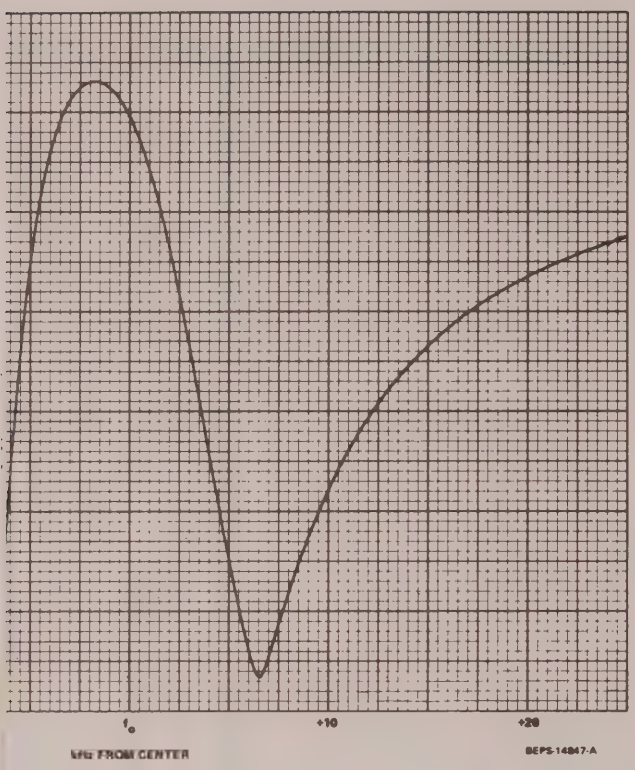


Figure 1.
Good Crystal in Position Y101 or Y103

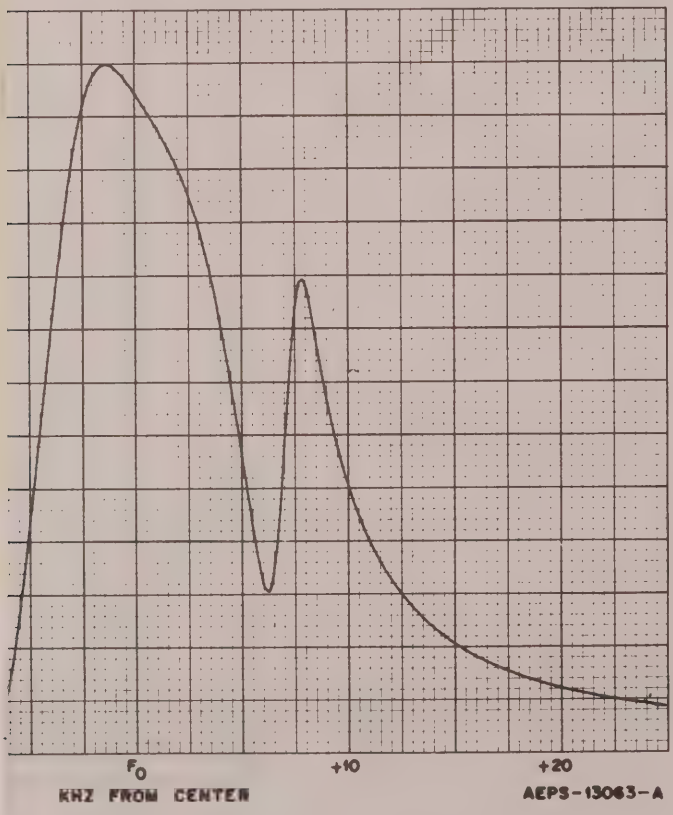


Figure 2.
wn Good Crystal in Position Y102 or Y104

"MICOR" "SENSITRON" RECEIVER RF AND I-F BOARD

MODEL TRF1011C
800 MHz

MODEL TABLE

MODEL	MODEL BREAKDOWN	DESCRIPTION
TRF1011C	TLF6021A	RF Deck
	TRF6011C	Receiver RF and IF Board
	TRN6713A	Second Oscillator
	TLF6163A	Quadrupler

TECHNICAL CHARACTERISTICS

RF FREQUENCY RANGE		806-821 MHz
CHANNEL SPACING		25 kHz
EIA MODULATION ACCEPTANCE		±8 kHz minimum
FREQUENCY		Channel element maintains receiver frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient temperature (+25°C reference).
INPUT IMPEDANCE		50 ohms
SENSITIVITY	20 dB QUIETING	0.5 uV
	EIA SINAD	0.35 uV
SELECTIVITY (EIA SINAD)		-80 dB @ ±25 kHz
EIA SINAD INTERMODULATION		-75 dB
SPURIOUS AND IMAGE REJECTION		100 dB minimum
SQUELCH SENSITIVITY CARRIER SQUELCH (adjustable)		.25 uV or less at threshold
TONE-CODED SQUELCH		.25 uV or less
DIGITAL-CODED SQUELCH		.25 uV or less

MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60172

6/12/81- UP

68P81037E04-D

PREAMPLIFIER

TLE8191A Preamplifier (406-450 MHz)
TLE8192A Preamplifier (450-512 MHz) PL-2693-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, variable: (includes standard tuning piston.)
C1	20-83693M03	0.9 - 9.0 pF (406-450 MHz)
	8720-83693M01	0.8 - 6.0 pF (450-512 MHz)
		(NOTE: Also order 76-84425B01 PISTON, tuning;(special) SEE NOTE 11)
		CAPACITOR, fixed:
	21-861441	500 pF ±10%; 75 V; N4700
	21-861219	.001 uF -100-0%; 500 V; coded RED
	23-84762H04	2.2 uF ±20%; 25 V
		CONNECTOR, receptacle:
	9-84135B01	female; coaxial; miniature type
		COIL, RF:
L1	47-84330B01	(straight rod; 1.75" long)
	24-800484	choke; 0.31 uH
	47-84330B03	(straight rod; 2.19" long)
		CONNECTOR, plug:
J1	28-84282D01	male; coaxial; miniature type
Q1, Q2		TRANSISTOR: (SEE NOTE 1)
	48-869539	field-effect 'N Channel'; type M9533; does not include 42-83680C01 CLIP, transistor retaining
		RESISTOR, fixed:
R1	6-10401C25	100 ±10%; 1/4 W
R2	6-185B73	330 ±10%; 1/8 W
R3	6-10401C17	47 ±10%; 1/4 W
		LINE, RF transmission: includes P2, P104 and 30-83794C01 CABLE, RF; coaxial; 6-1/2" length required
	R119 L R119M, H, HH	6-10401C45
	P105	28-84282D01
Q104, M, HH	48-869839	field-effect; N-channel M9839

NON-REFERENCED ITEMS

	1-80745B04	MIXER BOARD: includes reference parts C143, C143, C196, L122, Q104, R119
	3-138841	SCREW, tuning: used with L106, L107, L108
	2-84773X01	NUT, tensioning: "star" type; used with L106, L107, L108
	3-139002	SCREW, tuning: used with L111 thru 116
	2-84773X03	NUT, tensioning: "star" type; used with L111 thru 116

RF DECK

TLE8021A/B (406-420 MHz)
TLE8023A/B (450-470 MHz)
TLE8024A/B (470-494 MHz)
TLE8025A/B (494-512 MHz) PL-1878-M

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: PT ±5%, 500 V; unless otherwise stated
	21-943548	.001 uF ±10%; 200 V
	21-84900G01	10 pF ±0.25 pF; 500 V; NPO
	21-82355B26	
J102, 103, 104	9-84135B02	CONNECTOR, receptacle: female; coaxial; miniature type
L106L	24-84769E12	COIL, RF: (coded RED, RED); 6-5/8 turns, tapped
L106M, H	24-84769E14	4-1/2 turns (coded YEL, YEL); 6-1/8 turns, tapped
L106HH	1-80752B36	(coded VIOLET-VIOLET); 5-7/8 turns; tapped
L107L	24-84769E15	(coded GRN, GRN); 6-5/8 turns
L107M, MO, H, HH	24-84769E16	(coded BLU, BLU); 6-1/8 turns
L108L	24-84769E12	(coded RED, RED); 6-5/8 turns, tapped
L108M, H, HH	24-84734E01	(coded YEL, YEL); 6-1/8 turns, tapped
L111L	24-84731E09	4-1/2 turns
L111M	24-84731E01	4 turns, tapped
L111H	24-84731E04	3-3/4 turns, tapped
L111HH	24-84731E07	3-9/16 turns, tapped
L112L-112L	24-84731E10	4-1/2 turns
L112M-112M	24-84734E02	4 turns, tapped
L112HH thru L115HH	24-84731E05	3-3/4 turns
L112HH thru L116HH	24-84731E08	3-9/16 turns
L116L	24-84731E09	4-1/2 turns
L116M	24-84734E03	4 turns, tapped
L116H	24-84734E06	3-3/4 turns, tapped
L116HH	24-84731E07	3-9/16 turns, tapped
L122L	24-83884C06	YEL; 4-1/2 turns
L122M, H, HH	24-83884C03	BRN; 1-1/2 turns
L138	24-82723H04	choke; 0.29 uH
		RESISTOR, fixed: 660 ±10%; 1/4 W 560 ±10%; 1/4 W
R119 L R119M, H, HH	6-10401C45	
P105	28-84282D01	CONNECTOR, plug: male; coaxial; miniature type TRANSISTOR: (SEE NOTE)
Q104L, M, H, HH	48-869839	field-effect; N-channel M9839

NON-REFERENCED ITEMS

	1-80745B04	MIXER BOARD: includes reference parts C141, C143, C196, L122, Q104, R119
	3-138841	SCREW, tuning: used with L106, L107, L108
	2-84773X01	NUT, tensioning: "star" type; used with L106, L107, L108
	3-139002	SCREW, tuning: used with L111 thru 116
	2-84773X03	NUT, tensioning: "star" type; used with L111 thru 116

RECEIVER RF & IF BOARD

LEGEND:
L = 406-420 MHz
M = 450-470 MHz
H = 470-494 MHz
HH = 494-512 MHz
* = For B Suffix boards only

TLE8031A/B(406-420 MHz)
TLE8032A/B(450-494 MHz)
TLE8033A/B(494-512 MHz)

PL-1879-7

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: PT ±5%, 500 V; unless otherwise stated
C101 thru 112	21-82428B59	.01 uF +80-20%; 200 V
C113	23-84762H03	10 uF ±10%; 20 V
C114	21-82428B59	.01 uF +80-20%; 200 V
C115	23-84762H03	0.22 uF ±10%; 75 V
C116	21-82428B59	10 uF ±10%; 20 V
C117L	21-84288B39	27; N150
C117M, H	21-82133C44	18; N330
C117HH	21-83406D01	15; N330
C118L	21-84503B46	0.62; coded BLU-RED-GRAY-GOLD
C118M, H, HH	21-82450B29	0.51; coded GRN-BRN-GRAY-GOLD
C119L	21-83406D06	39; N220
C119M, MO, H, HH	21-84493B44	33; 250 V; N150
C120	21-82610C44	100; 100 V; N220
C121	21-82428B59	.01 uF +80-20%; 200 V
C122	21-857336	2 ±0.25 pF; NPO
C123	21-82187B08	220 ±10%
C124	21-82187B11	.0015 uF ±10%; 100 V
C125L	21-82133G73	12; N150
C125M, H, HH	21-838912	8 ±0.25 pF; N150
C126L	21-84493B44	33; N150
C126M, MO, H, HH	21-82L10C14	30, 200 V, N150
C127	21-82428B59	.01 uF +80-20%; 200 V
C128	21-831125	100 ±10%; 300 V; N750
C129	21-82187B08	220 ±10%
C130	23-84762H04	2.2 uF ±20%; 25 V
C131L	21-83406D51	3 ±0.25 pF; NPO
C131M, H	21-857336	2.0 ±.25 pF; NPO
C131HH	21-864687	1.5 ±0.25 pF; NPO
C132	21-82450B35	0.2 ±10%; coded RED-BLK-GRAY-SILVER
C133L	21-82133G18	6 ±0.25 pF; N470
C133M, H, HH	21-849320	4 +0.25 pF; N470
C134L	21-84493B43	8 ±0.25 pF; N470
C134M, H, HH	21-82204B33	5 ±0.25 pF; N470
C135	21-82428B59	.01 uF +80-20%; 200 V
C136L	21-82610C07	51; 200 V; N150
C136M, H, HH	21-847056	10; 250 V; N150
C137	23-84762H04	2.2 uF ±20%; 25 V
C138	21-82355B30 or 21-82355B39	2.7 ±0.1 pF; NPO (450-512 MHz) 4.7 ±0.1 pF; NPO (406-420 MHz)
C139, 140	21-82428B59	.01 uF +80-20%; 200 V
C141	21-82187B17	820 ±10%
C144	21-82610C03	47; 200 V; N220
C145	21-82133G01	10; NPO
C146	8-82905G04	.068 uF ±10%; 50 V
C147	23-84762H04	2.2 uF ±20%; 25 V
C148, 149	21-82133G01	10; NPO
C150, 151	21-82428B59	.01 uF +80-20%; 200 V
C152	21-82133G33	6.8 ±0.5 pF; NPO
C153	21-82450B04	0.3 ±10%; coded ORG-BLK-GRAY-SILVER
C154	21-82450B35	0.2 ±10%; coded RED-BLK-GRAY-SILVER
C155	21-82450B07	0.3%; coded ORG-WHT-GRAY-GOLD
C156	21-82610C43	62; 100 V; NP5
C157	21-82428B59	.01 uF +80-20%; 200 V
C158	21-82133G29	18; NPO
C159, 160, 161	21-82428B57	.0033 uF ±10%; 200 V
C162	21-82428B59	.01 uF +80-20%; 200 V
C163	8-83813H05	.068 uF ±10%; 100 V
C164	21-82610C84	39; 450 V; NP0
C165	21-82355B09	33; NP0
C166	21-82450B33	0.56; coded GRN-BLU-GRAY-GOLD
C167	21-82450B07	0.3%; coded ORG-WHT-GRAY-GOLD
C168	21-82355B09	33; NP0
C169	21-82610C45	68; 100 V; NP0
C170	21-82428B57	.0033 uF ±10%; 200 V
C171, 172	21-82428B59	.01 uF +80-20%; 200 V
C173	21-82428B57	.0033 uF ±10%; 200 V
C174	23-84762H04	2.2 uF ±20%; 25 V
C175	8-83813H06	0.1 uF ±10%; 100 V
C176, 177	21-82428B57	.0033 uF ±10%; 200 V
C178	21-82187B08	220 ±10%
C179	21-82428B57	.0033 uF ±10%; 200 V
C180, 181	21-83798B01	100; 200 V; NP0
C182	21-82428B59	.01 uF +80-20%; 200 V
C183, 184	21-82187B07	470 ±10%
C185, 186, 187	21-82187B39	470 ±10%
C188	21-82428B59	.01 uF +80-20%; 200 V
C189	21-82428B57	.0033 uF ±10%; 200 V
C190	21-84493B24	68; N150
C191	21-82610C07	51; N150
C192	21-861442	.75 uF ±100-20%; 75 V
C193, 194	21-840848	6 ±.5 pF; NP0
C195	21-82355B24	10 ±0.25 pF; NP0
C197	21-82355B26	10 ±0.25 pF; NP0
C198	21-82428B59	0.01 uF +80-20%; 200 V
CR101, 102	48-823928B13	SEMICONDUCTOR DEVICE, diode: (SEE NOTE 1) silicon
CR103, 104	48-82139G01	germanium
CR105 thru 108	48-84616A01	silicon; hot carrier type
IC101	51-84561L68	INTEGRATED CIRCUIT; type M6718
IC102	51-84561L69	type M6707
J101	9-84207B01	CONNECTOR, receptacle: metering; 7-contact
J105	9-84231B02	female; coaxial; miniature type
L101	24-84972A15	COIL, RF: RED; 8-1/2 turns, tapped at 2-1/8 turns, includes tuning core
L102	24-84972A16	RED; 8-1/2 turns; includes tuning core
L103	24-84972A17	ORG; 6-1/2 turns, tapped at 1-7/8 turns; includes tuning core
L104	24-83857G07	YEL; 3-1/2 turns, tapped at 1-5/8 turns; includes tuning core
L105	24-83856G05	GRN; 3-1/2 turns; includes tuning core
L109	24-83879G04	YEL; 20 turns; includes tuning core
L110	24-84258B06	BLU; 16 -2/3 turns; includes tuning core
L117L		NOT USED
L117M, H	24-82542E01	.1 uH; choke
L117HH	24-82542E11	.248 uH; choke
L118	24-82723H07	choke; .939 uH
L120, 121	24-82723H03	5 turns
L123		NOT USED
L124	24-82549D25	choke; 10 uH; coded VIO
L125	24-84250D02	choke; 10 uH; shielded; coded (SILVER)-BRN-BLK-BLK-GOLD
L126	24-82723H07	choke; 6.8 uH; shielded; coded WHT-BLU-GOLD-GRAY-GOLD
L127, 128	24-84250D02	choke; 18 uH; coded VIO
L129, 130	24-82723H07	choke; 6.8 uH; shielded; coded WHT-BLU-GOLD-GRAY-GOLD
L131 thru 136	24-83961D01	choke; 10 uH; coded VIO
L137	24-84250D03	3 turns over ferrite bead; coded BRN
P102	28-84227B01	choke; 2.2 uH (shld.) coded WHT-RED-GOLD-RED-GOLD
Q101	48-869658 or 48-869570	CONNECTOR, plug: male; coaxial; miniature type TRANSISTOR: (SEE NOTE 1) NPN; type M9658 (450-512 MHz) NPN; type M9570 (406-420 MHz)
Q102	48-869658	NPN; type M9658
Q103	48-869756	NPN; type M9756
*Q104, 105	48-869642	NPN; type M9642
P106		CONNECTOR, plug: (for reference only)
R101	6-129755	RESISTOR, fixed: ±10%, 1/4 W; unless otherwise stated 10
R102	6-127807	33k
R103	6-129230	12k
R104	6-129231	3.3k
R105	6-129269	1.8k
R106	6-127806	27k
R107	6-10401A13	33 ±5%
R108	6-129862	150
R109	6-128685	22k
R110	6-129231	3.3k
R111	6-129269	1.8k
R112	6-124A09	22 ±5%
R113	6-129862	150
R114	6-129755	10
R115L	6-10401C87	75%
R115M, H, HH	6-127807	33%
R116L	6-10401C57	2.2%
R116M, H, HH	6-127803	1.5%
R117	6-129224	62
R118L	6-10401C59	2.7%
R118M, H, HH	6-127803	1.5%
R120, 121		NOT USED
R123	6-129667	22k ±5%
R124	6-129233	47k
R125	6-129667	22k ±5%
R126	6-131289	910 ±5%
R127	6-129667	22k ±5%
R128	6-129237	6.8k ±5%
R129	6-129982	5 ±5%
R130	6-131377	15
R131	6-129236	15k ±5%
R132	6-129667	22k ±5%
R133	6-131289	910 ±5%
R134	6-129667	22k ±5%
R135	6-129668	10k ±5%
R136	6-129755	10
R137	6-124C86	36k
R138	6-127803	1.5k
R139	6-10401A76	13k ±5%
R140	6R124A76	13k ±5%
R141	6-127802	1k
R142	6-129226	100k
R143	6-128902	47k
R144	6-10401C81	22k
*R145	6-124C89	47k
R146	6-124C69	6.8k
R147	6-124C89	47k
*Y101	48-84755E01	CRYSTAL UNIT, quartz: 11.7 MHz
*Y102	48-84755E01 or 48-84755E05	1-7 filter 1-8 filter
*Y103, 104	48-84755E01 or 48-84755E05	1-7 filter 1-8 filter
Y105	48-84754E01	discriminator

*When replacing Y102, Y103 or Y104, order Part No. 48-84755B01 only.

NON-REFERENCED ITEMS

	3-138804	SCREW, machine; 4-40 x 5/16" includes lockwasher; 5 used
	3-138891	SCREW, tapping; 6-32 x 7/16" includes lockwasher; 9 used
	3-139506	SCREW, tapping; 4-40 x 5/16" includes lockwasher; 8 used
	4-49854	WASHER, spacer; 2 used
	5-84500B03	EYELET, special; 8 used
	16-84560B01	INSULATOR, dual; 0.55" long x 0.22" wide; 4 used
	14-84583B01	INSULATOR, dual; 0.74" long x 0.37" wide
	26-83838F01	SHIELD, coil
	26-84250B01	SHIELD, coil; 0.750" inside dimension
	26-84250B03	SHIELD, coil; 0.625" outside dimension
	26-84250B08	SHIELD, coil; 1" outside dimension
	26-84250B12	SHIELD, coil; 0.750" inside dimension; 1.25" high
	26-84250B13	SHIELD, coil; 1" outside diam.; 1.30" high
	26-84253D01	SHIELD, can; 1.56" wide x 2.625" long
	26-84614G01	SHIELD, coil; 0.625" outside dimension
	26-84639E01	SHIELD, barrier
	26-84641D01	SHIELD, bottom
	26-84642E01	SHIELD, bottom
	26-84661E01	SHIELD, barrier
	28-84227B01	CONNECTOR, phono
	42-84284D01	RETAINER; 8 used
	55-84300B02	HANDLE (long); 2 used
	55-84300B03	HANDLE (short)

REVISIONS 6879010E38-C

CHASSIS & SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLE8031A/B THRU TLE8033A/B	IC101	FROM 51-84267A18	1ST I-F AMPLIFIER
	IC102	FROM 51-84267A07 TO 51-84561A55	2ND I-F AMPLIFIER
TLE8021A/B THRU TLE8025A/B		ADDED SUFFIX /B TO MODEL NO.	

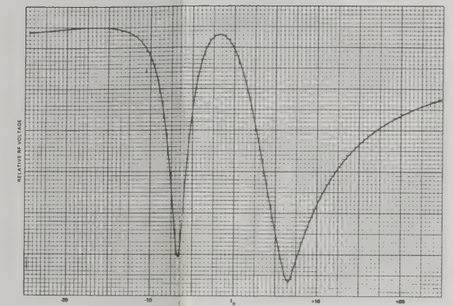


Figure 1.
Typical Plot of a Known Good Crystal in Position Y101 or Y103

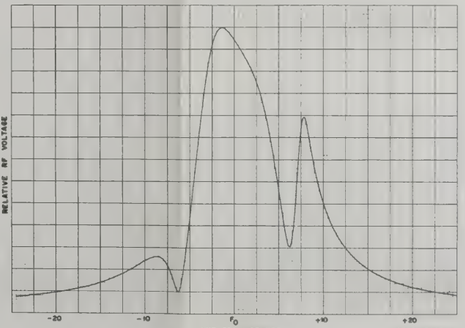


Figure 2.
Typical Dip Plot of a Known Good Crystal in Position Y102 or Y104

"MICOR" "SENSITRON" RECEIVER RF AND I-F BOARD

MODEL TRF1011C
800 MHz

MODEL TABLE

MODEL	MODEL BREAKDOWN	DESCRIPTION
TRF1011C	TLF6021A	RF Deck
	TRF6011C	Receiver RF and IF Board
	TRN6713A	Second Oscillator
	TLF6163A	Quadrupler

TECHNICAL CHARACTERISTICS

RF FREQUENCY RANGE		806-821 MHz
CHANNEL SPACING		25 kHz
EIA MODULATION ACCEPTANCE		±8 kHz minimum
FREQUENCY		Channel element maintains receiver frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient temperature (+25°C reference).
INPUT IMPEDANCE		50 ohms
SENSITIVITY	20 dB QUIETING	0.5 uV
	EIA SINAD	0.35 uV
SELECTIVITY (EIA SINAD)		-80 dB @ ±25 kHz
EIA SINAD INTERMODULATION		-75 dB
SPURIOUS AND IMAGE REJECTION		100 dB minimum
SQUELCH SENSITIVITY CARRIER SQUELCH (adjustable)		.25 uV or less at threshold
TONE-CODED SQUELCH		.25 uV or less
DIGITAL-CODED SQUELCH		.25 uV or less

MOTOROLA INC.
Communications Division

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1. INTRODUCTION

This section contains specific theory of operation, maintenance, and troubleshooting information on the receiver rf and i-f deck.

2. RECEIVER RF AND I-F DECK FUNCTIONAL DESCRIPTION

2.1 RF INJECTION STRING

2.1.1 Oscillator (Channel Element)

Channel elements are temperature compensated, crystal controlled oscillators (TCXO), operable over the temperature range of -30° to +60°C (-22° to +140°F). A variable warp capacitor, located in the base of the oscillator, is provided for increased accuracy. Channel elements are factory sealed plug-in modules and should not be field serviced.

2.1.2 Multipliers

The third harmonic of the channel element is selected by a two cell LC tuned circuit. The signal is then multiplied 16 times by two doubler circuits and a quadrupler circuit and applied to the two cell preselector of the first mixer.

2.2 RF PRESELECTOR

RF preselector selectivity prevents receiver degradation from mixer image frequency and spurious harmonics. It consists of five low loss, highly selective helical resonant cavities. The bandpass of the preselector is characterized by a flat acceptance bandwidth and a steep skirt response. Carrier signals received at the antenna are routed through the preselector cavities to the mixer stage to be hetrodyned with the injection frequency.

2.3 FIRST MIXER

The first mixer hetrodynes the rf signal from the injection string with the carrier signal from the preselector, producing a high i=f of 45 MHz. Frequency relationships are as follows:

$$fc = 48\ fo + 45\ MHz$$

Where: fc = carrier frequency
fo = channel element fundamental

2.4 DOUBLE-POLE CRYSTAL FILTER

The double-pole crystal filter accepts the high i-f of 45 MHz and attenuates signals outside the bandwidth. It increases receiver selectivity and couples the high i-f to the second mixer.

2.5 SECOND MIXER

The second mixer uses a field effect transistor with low noise level and high conversion gain to heterodyne the high i-f with a second oscillator frequency, producing a low i-f of 11.7 MHz. Frequency relationships are expressed as follows:

$$45\ MHz = fo + 11.7\ MHz$$

Where fo = second oscillator frequency

2.6 SECOND OSCILLATOR AND BUFFER

The second oscillator is a crystal controlled, tunable oscillator. It employs a buffer output to prevent load variations from degrading the generated signal and filtering to reduce spurious harmonics.

2.7 FIRST FOUR-POLE CRYSTAL FILTER

This filter and the second four-pole crystal filter are the major factors determining final receiver bandwidth and selectivity.

The first four-pole crystal filter consists of two monolithic crystals and associated impedance matching circuitry. The output of the mixer is coupled to the input of the filter by an adjustable matching network.

Each crystal produces mechanical vibrations at the crystal input when the electrical i-f signal is applied. Due to the inherent piezoelectric property of quartz crystals, these vibrations are propagated throughout the crystal and reconverted

to electrical signals at the output electrodes. The high "Q" of the crystals creates a narrow bandpass resulting in excellent off-channel signal rejection.

2.8 FIRST I-F AMPLIFIER

The first i-f amplifier couples signals between the first and second four-pole crystal filters and provides approximately 70 dB gain. The IC contains three differential amplifier stages that are internally voltage regulated and temperature compensated. Isolation between the three stages is provided internally.

2.9 SECOND FOUR-POLE CRYSTAL FILTER

The second four-pole crystal filter establishes final receiver selectivity and operates identically to the first four-pole crystal filter previously described. The filter signal is applied to the second i-f amplifier.

2.10 SECOND I-F AMPLIFIER AND LIMITER

The second i-f amplifier and limiter consists of and IC with associated discrete components and performs amplification and limiting functions.

Four differential amplifiers with internal voltage regulation and temperature compensation are employed. The first two differential amplifiers provide approximately 55 dB gain. The second stage output provides metering and is applied to the third stage. The third stage, along with the fourth stage, becomes overdriven to provide excellent symmetrical limiting characteristics. Full limiting occurs regardless of signal strength.

The limited output of the second i-f amplifier is applied to the discriminator. Since amplitude has now been made constant, the discriminator, which normally would respond to both amplitude and frequency variations, will produce true frequency demodulation.

3. MAINTENANCE

3.1 INTRODUCTION

This section provides maintenance procedures for the receiver rf and i-f board. These procedures consist of tests which include metering measurements and testing and troubleshooting procedures that includes integrated circuit checks.

NOTE

The receiver rf and i-f board must be installed in a receiver chassis for testing to provide the necessary power, ground, control and signal connections. The board should always be secured in place with all mounting screws for operation and testing to provide a good rf ground to all stages of the receiver.

3.2 PERFORMANCE TESTS

3.2.1 General

Use the following tests to determine if the receiver rf and i-f board is operating properly. If testing produces unsatisfactory results, refer to the receiver rf and i-f troubleshooting chart (diagram PEPS-24796).

3.2.2 No-Signal Meter Reading Test

A failure in any part of the rf and i-f board will usually result in improper meter readings at one or more test positions. Perform checks at meter position 1 through 5 and compare the results with values shown in Table 1.

Table 1. Minimum Receiver RF & I-F Meter Readings (No Input Signal Applied)

Selector Switch Position	Reading (Micro-Amps)	Circuit Metered
1	10	Channel element output
2	15	First Doubler output
3	10	Second Doubler output
4+, 4-	0 ±2	Discriminator output
5	10	Second i-f amplifier & limiter

3.2.2.1 Using the Portable Test Set

Step 1. The receiver rf and i-f board must be installed in a complete receiver chassis for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver.

Step 4. Using a TEK-37 Adapter Cable, connect a Motorola portable test set or meter panel to the receiver as follows:

-- Connect the adapter cable 20-pin connector to the receptacle on the front of the test set or meter panel.

-- Connect the adapter cable 7-pin white "metering" plug to the metering receptacle on the receiver rf and i-f board.

Step 5. Set the portable test set switches as follows:

--Set the function switch to the RCVR position.

--Set the meter reversing switch to the OFF position.

--Set the adapter cable SENS switch to the 100 mV position. If the adapter cable has no SENS switch, the unit operates at 100 mV all of the time.

--Set the adapter cable reference switch to position A or position B.

Step 6. Refer to the readings in Table 1. Set the test set selector switch to the positions called for in the Table and observe the test set meter. Notice that the meter readings given in the Table are minimums.

3.2.2.2 Input Voltages

3.2.2.2.1 If there are no test set indications at one or more of the metered points, check the dc input voltages to the receiver rf and i-f circuit board.

P904-9	A+ continuous (+13.8 V dc with reference to chassis)
P904-11	9.6 V dc continuous with reference to chassis) (±0.5 V)
P904-8,6	9.6 V dc continuous (with reference to chassis) (±0.5 V)

3.2.2.2.2 If test set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

3.2.2.2.3 Using Built-In Receiver Metering

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the station.

Step 4. Plug the receiver service kit into the station.

NOTE

The receiver service kit will not operate unless the TKN6759A Cable Kit has been installed in the receiver.

It is not necessary to turn the metering POWER switch on. The switch should only be in the "on" position when the METER SELECTOR switch is set on position 6.

Step 5. Refer to the meter reading table in paragraph 4.2.2. Set the meter selector switch to the positions called for in the table and observe the meter. Notice that the meter readings given in the table are minimums.

3.2.2.3 20 dB Quieting Sensitivity Test

This performance test may be used after repair and alignment to assure that the receiver meets all specifications before it is returned to service. The receiver shield must be in place while performing this test.

3.2.2.3.1 Using an AC Voltmeter and Portable Test Set

Step 1. Perform Steps 1 thru 5 in paragraph 3.2.2.1.

Step 2. Connect an ac voltmeter across pins 1 and 18 of the audio control module.

Step 3. (PL receivers only) Disable PL, using the switch on the PL module.

Step 4. Set the receiver squelch control fully counterclockwise (unsquelched).

Step 5. Adjust the LINE LEVEL control so the ac voltmeter reads 565 mV ac.

Step 6. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until test set meter position 4 reads exactly zero.

Step 7. Slowly decrease the signal generator output level until the ac voltmeter reads 56.5 mV ac (20 dB down from 565 mV ac). Switch to a lower voltmeter scale if necessary.

NOTE

The output frequency of some signal generators will be "pulled" when the

NOTE (Cont'd.)

output level is near maximum. It may be necessary to reset the generator frequency to zero meter 4 as the output level is reduced.

Step 8. Note the signal generator output level. If the receiver rf and i-f board is functioning properly, this level should be 0.5 uV or less.

Step 9. Readjust the LINE LEVEL control as described in the MAINTENANCE section of the manual.

3.2.3.2 Using Built-In Receiver Metering

Step 1. The receiver rf and i-f board must be installed in a complete receiver for testing. Make sure the rf and i-f circuit board mounting screws are all secure and that all connections to the board are properly made.

Step 2. Be sure the receiver shield is in place.

Step 3. Apply ac input power to the receiver. Turn metering on.

Step 4. Unsquelch the receiver by turning the SQUELCH control fully counterclockwise. "Private-Line" stations must also be PL disabled.

Step 5. Set meter selector switch to POS 6 and the speaker. sw to the "off" POS. Adjust the LINE LEVEL control for 50 uA as indicated on the meter.

Step 6. Connect an rf signal generator to the receiver input connector.

Step 7. Set the signal generator controls as follows:

--Set up the signal generator to produce a CW or unmodulated signal.

--Set the generator output level to maximum.

--Set the signal generator output frequency to the selected channel receive frequency. To set the signal generator on frequency without a frequency counter, adjust the generator frequency control until meter position 4 reads exactly zero.

Step 8. Slowly decrease the signal generator output level until MTER POS 6 reads 5 uA.

NOTE

The output frequency of some signal generators will be "pulled" when the output level is near maximum. It may be necessary to reset the generator frequency to zero meter 4 as the output level is reduced.

Step 9. Note the signal generator output level. If the receiver rf and i-f board is functioning properly, this level should be 0.5 uV or less.

Step 10. Readjust the LINE LEVEL control as described in the MAINTENANCE section of the manual.

3.3 FIRST MIXER REPLACEMENT PROCEDURE

3.3.1 General

3.3.1.1 Extreme care must be exercised in removing the mixer substrate. It is recommended that complete troubleshooting be performed to assure that the mixer is faulty before attempting replacement. No attempt should be made to repair individual substrate components. Rather, the mixer should be replaced as an assembly.

3.3.1.2 Two types of soldering irons are required to remove and replace the mixer. A chisel tipped iron of 150 watt rating is needed for connections to the rf deck. A small iron of 50 watt rating is required for substrate connections.

3.3.2 Replacement Procedure

Step 1. Remove the receiver rf and i-f board from the chassis.

Step 2. Unplug the mixer output cable from the rf and i-f board and remove the screws holding the cable lugs to the rf deck.

Step 3. Remove the four hex-Phillips screws which hold the mixer cavity shield.

Step 4. Using the large iron, unsolder the ground straps from the rf deck, adding solder as necessary to insure proper heat transfer.

Step 5. Carefully unsolder the two heavy gauge wire connections leading to pads at the top edge of the mixer substrate.

CAUTION

Prolonged heat or excessive strain at these connections may result in permanent damage to the substrate and associated components.

When both leads are free, bend the leads slightly to facilitate easy removal of the substrate.

Step 6. Lift the substrate VERTICALLY out of the rf deck.

Step 7. Press the nylon guides onto the edges of the replacement mixer substrate and carefully slide the unit into the rf deck.

Step 8. Using a large, well tinned iron, solder the ground straps to the rf deck. Remove excess solder to allow the cover to fit flush over the mixer cavity.

Step 9. Bend the heavy leads to conform to the pads on the substrate. The leads must be formed so that no strain is placed on the substrate when the leads are soldered in place. Use the minimum heat necessary to insure a good solder connection.

Step 10. Replace mixer cavity cover.

3.4 QUADRUPLER REPLACEMENT PROCEDURES

3.4.1 Assembly Replacement Procedure

Step 1. Disconnect the input coaxial cable (phono connector to printed circuit board) and the output cable (coaxial cable from the injection filter).

Step 2. Disconnect the 9.6 volt supply line (orange) at the printed circuit board.

Step 3. Remove the screws which fasten the input coaxial cable to the rf deck.

Step 4. Remove the three screws which fasten the quadrupler housing to the rf deck.

Step 5. Replace the new quadrupler assembly in the reverse order of the above procedure.

4.4.2 Transistor Replacement Procedure

Using a 50 watt soldering iron and silver solder (silver content 2%), perform transistor replacement as follows.

Step 1. Carefully unsolder L201, L203, and R201 at the transistor pads and bend the components away from the transistor.

Step 2. Unsolder and remove the transistor.

Step 3. Remove excess solder from the substrate solder pads.

Step 4. Place the new transistor on the substrate pads. While holding the transistor in place with a tweezers, solder the emitter lead first and then the remaining leads. Be sure the transistor leads are positioned in the center of their respective substrate pads.

Step 5. Reposition L201, L203, and R201 and resolder their leads.

Step 6. Perform quadrupler testing to insure unit is properly functioning.

3.5 TROUBLESHOOTING

3.5.1 Visual Inspection

3.5.1.1 The first step in the troubleshooting procedure should be a thorough visual inspection of the receiver and, in particular, the receiver rf and i-f board. Corrosion and burned or damage components are usually easily seen and may be the cause or a symptom of the receiver malfunction. Loose circuit board mounting screws or a loose or improperly installed receiver shield are other easily found problems that can cause a considerable degradation in receiver performance.

3.5.1.2 After the "obvious" problems have been corrected, repeat the receiver rf and i-f board performance tests. If the tests still produce unsatisfactory results, refer to the receiver rf and i-f troubleshooting chart. The troubleshooting chart provides a systematic procedure for isolation of the defective stage and component.

3.5.1.3 As much information as possible has been included on the troubleshooting chart. However, you will have to refer occassionally to the receiver rf and i-f schematic diagram and circuit board detail. Detailed procedures regarding integrated circuits, troubleshooting, receiver gain measurements, and crystal dip tests follow in the text of this section of the manual.

3.5.2 Alignment as a Troubleshooting Technique

Low test set readings, improper discriminator output, and otherwise abnormal

performance are very often corrected by realignment. Therefore, alignment should be one of the first troubleshooting steps performed for these symptoms.

3.5.3 Troubleshooting Integrated Circuits

3.5.3.1 Integrated circuits (ICs) are very reliable components and should not be replaced unless it is definitely indicated that the IC is the defective component. Before replacing an IC, make sure that the external components in the circuit are normal.

3.5.3.2 The ICs on the receiver rf and i-f board may be checked by dc voltage measurements. Proper voltages are shown in Table 2.

Table 2. Nominal Receiver Integrated Circuit DC Voltages
(All readings are in volts dc, measured with respect to chassis)

PIN NO.	U601 VOLTAGE	U602 VOLTAGE
1	GND	2.8
2	GND	GND
3	2.9	2.9
4	6.6	6.6
5	9.3	9.3
6	7.2	7.2
7	6.4	6.4
8	2.9	2.9
9	2.9	2.9
10	GND	GND

NOTE: All voltages may vary ±10% from nominal readings shown.

3.5.4 Receiver Gain Measurements

A defective crystal in the i-f selectivity portion of the receiver can be located by measuring receiver gain voltages and performing crystal dip tests.

NOTE

Before making any receiver gain measurements, make sure the case of every filter crystal has a good conductive path to ground. An ohmmeter test should indicate less than 1 ohm between the crystal case and the receiver circuit board ground plating. A bad ground connection may cause errors in gain measurements.

Step 1. Proper receiver alignment is essential to this procedure. Complete receiver rf and i-f alignment. Leave alignment test equipment connected to perform this check.

Step 2. Refer to receiver gain measurements in Table 3, the rf and i-f schematic diagram, and the rf and i-f circuit board detail.

NOTE

Receiver rf input voltages given in Table 3 are those at the receiver input connector. If a pad or other attenuator is connected between the signal generator and the receiver rf input, the signal generator output control must be set to compensate for the loss in the pad.

EXAMPLES:

6 dB loss means V out of the pad = 1/2 V into the pad.

20 dB loss means V out of the pad = 1/10 V into the pad.

Step 3. Set the signal generator output frequency to the receiver channel frequency ("0" reading on meter 4). Adjust the signal generator output to provide the required receiver input voltage for a particular test point as listed in the table. Then, using an rf voltmeter, measure the rf signal voltage between the test point and a nearby chassis ground point. When using a high impedance rf probe (see Table of Recommended Test Equipment), the measured voltage at every test point should be within ±6 dB of the value given in Table 3.

Table 3. Receiver Gain Measurements

TEST POINT (See rf & i-f circuit board detail	RECEIVER INPUT VOLTAGE (preset)	TEST POINT VOLTAGE (mV) ±6 dB	REMARKS
L	50 mV	180	
M	50 mV	250	
N	50 mV	600	
O	50 mV	575	
P	50 mV	550	
Q	50 mV	500	
R	50 mV	250	U601
S	50 mV	800	saturated
T	20 uV	400	output
U	20 uV	375	
V	20 uV	350	
W	20 uV	300	U602
X	20 uV	75	saturated
Y	0	1000	output

Step 4. A high or low test point voltage measurement may indicate that the crystal at or ahead of the test point is defective. However, it may also indicate that an associated circuit component is defective. The extremely high-Q crystals used in "Micor"® radios are very sensitive to associated circuit components. For example, if L601 is defective, it might appear that Y601 is bad. To isolate the defective component, perform the crystal dip tests described in the following procedure.

3.5.5 Crystal Dip Test

3.5.5.1 A defective crystal in the i-f selectivity portion of the receiver can be located by measuring receiver gain voltages and performing crystal dip tests.

3.5.5.2 The monolithic crystals used in "Micor" receivers are made up of two separate resonators on a single quartz blank. Each crystal has a pair of characteristic operating frequencies. One way to find the characteristic frequencies of each crystal is to short the crystal output to chassis ground, then monitor the crystal input voltage with an rf voltmeter while varying the signal generator frequency across the bandpass of the receiver. Low voltage points will occur at each of the crystal characteristic frequencies.

3.5.5.3 Figures 1 and 2 are plots of typical rf voltmeter readings obtained while testing good crystals. Note that the horizontal scales are calibrated in frequency, with f_o the channel frequency of the receiver. The vertical scales represent relative rf voltmeter readings. The bottom line is zero and the top line is maximum. Notice that each plot has a sharp minimum point above f_o and another below f_o. The table of crystal dip frequencies at the end of this section lists the frequencies at which these dip points should appear. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective.

Step 1. Leave the test equipment set up as was done for the receiver gain measurements.

Step 2. Set the signal generator to f_o, the receiver channel frequency ("0" on meter 4). Adjust the generator output control for at least 50 mV at the receiver input connector.

Step 3. Refer to the crystal dip frequencies in Table 4. To test a particular crystal, find it in the table, ground the indicated test point, and connect an rf voltmeter between the monitored test point and a nearby chassis ground point.

Step 4. Starting at f_o, slowly increase the signal generator frequency while watching for a dip in the rf voltmeter reading. This dip should be sharp, so increase the signal generator frequency very slowly and watch the rf voltmeter closely. When the dip is found, write down the frequency counter reading.

Step 5. Return the signal generator to f_o. Then watch the rf voltmeter while slowly decreasing the signal generator frequency. When the dip is found, write down the frequency counter reading.

Step 6. Compare your test results with the frequencies and tolerances listed in the table for the crystal you have tested. If the measured dips fall outside the tolerances listed in the table, the crystal may be defective. Continue with this procedure to isolate the bad component.

Step 7. FOR TEST PURPOSES ONLY, exchange the suspected crystal with another from the receiver. Be sure you note the polarity of the crystal when you make the change. Repeat the receiver gain measurement and crystal dip test on the suspected crystal in the new location. If the suspected crystal tests bad again, consider it defective and replace it. If the crystal tests good, look for defective associated components at the original crystal location.

Step 8. When the tests are completed, be sure all jumpers connected during the test are removed and that any moved crystals are returned to their original locations. Refer to the parts list and circuit board detail for correct part location. Note crystal polarity when replacing crystals.

3.5.6 Quadrupler Troubleshooting

Disconnect the input coaxial cable (phono connector to printed circuit board). Test the second doubler output. If the second doubler is operating properly, reconnect the quadrupler input coaxial cable to the 2nd doubler. Disconnect the quadrupler output cable. Using a 50 ohm probe, rated for at least 1000 MHz, test the quadrupler output voltage. A minimum reading of 70.7 millivolts should be obtained. If the minimum reading is not obtained, check the dc voltages on the schematic.

Table 4. Crystal Dip Frequencies

CRYSTAL	TEST POINT GROUNDED	TEST POINT MONITORED	+ FREQUENCY DIP (kHz) ±2.5 kHz	- FREQUENCY DIP (kHz) ±2.5 kHz
Y601	O	N	4.5	9.0
Y602	Q	P	4.0	10.0
Y603	U	T	4.5	9.0
Y604	W	V	4.0	10.0

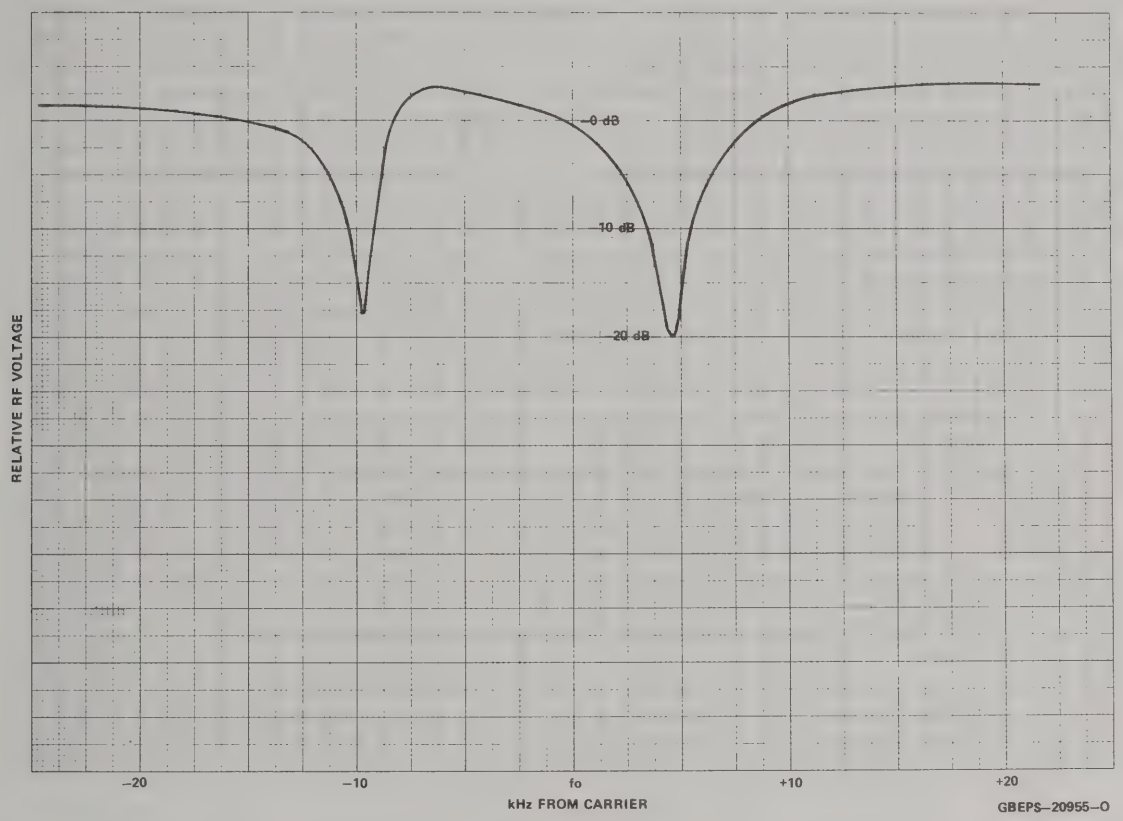


Figure 1. Typical Plot of a Known Good Crystal in Position Y601 or Y603

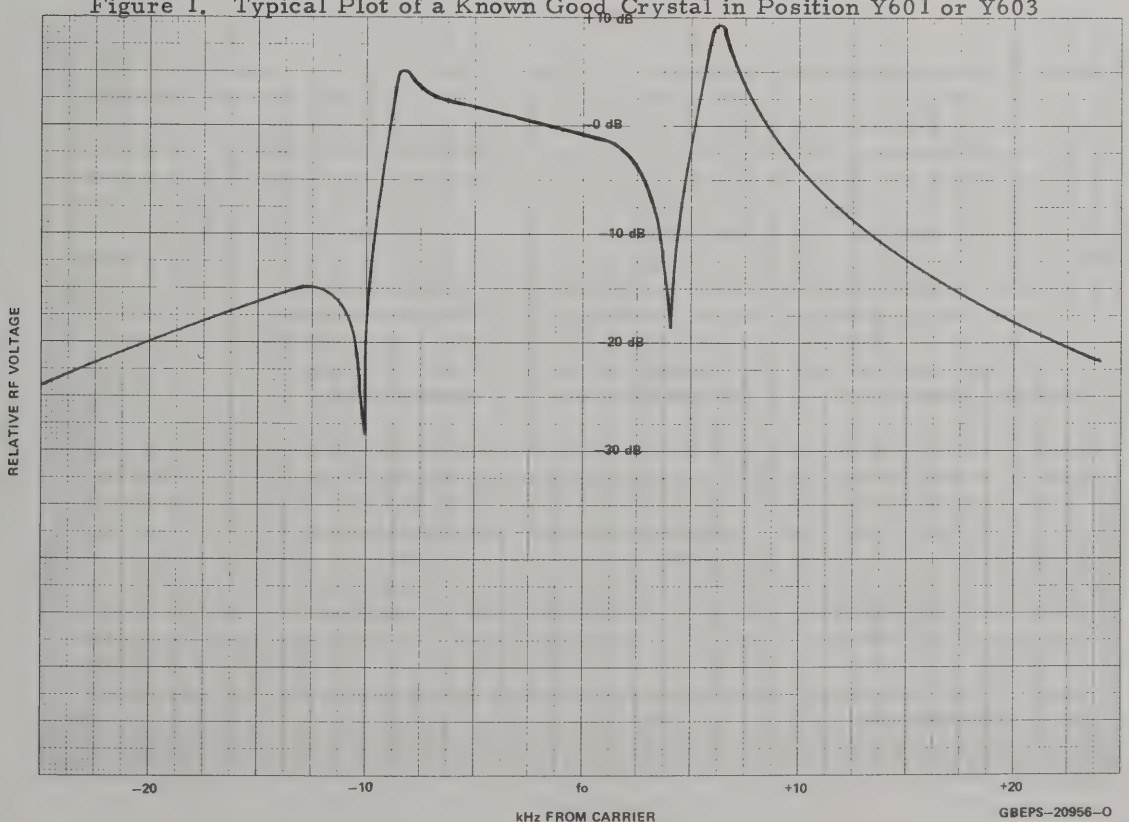
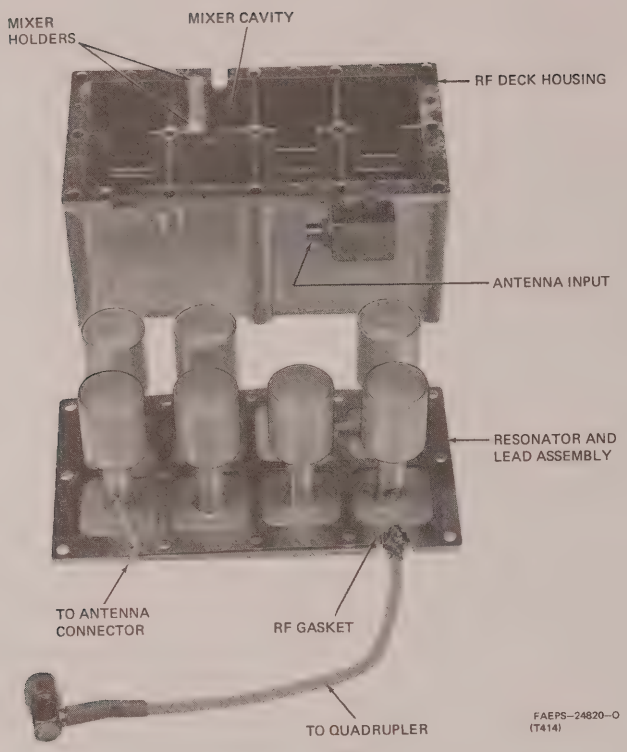
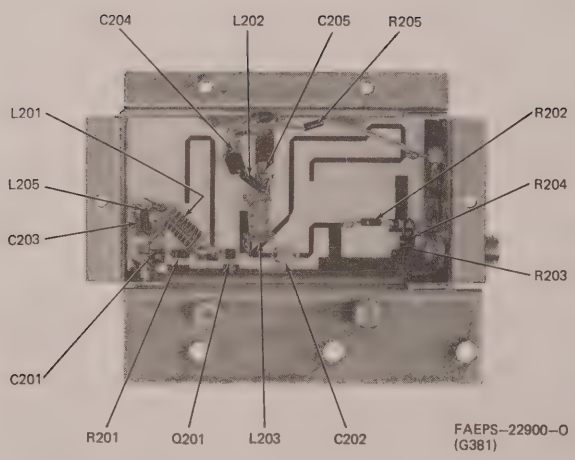


Figure 2. Typical Dip Plot of a Known Good Crystal in Position Y602 or Y604


MIXER HOLDERS
MIXER CAVITY
RF DECK HOUSING
ANTENNA INPUT
RESONATOR AND LEAD ASSEMBLY
TO ANTENNA CONNECTOR
RF GASKET
TO QUADRUPLER
FAEPS–24820–O (T414)


C204
L202
C205
R205
L201
R202
L205
R204
C203
R203
C201
R201
Q201
L203
C202
FAEPS–22900–O (G381)

DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

RECEIVER ALIGNMENT PROCEDURE

A. FREQUENCY CALCULATIONS

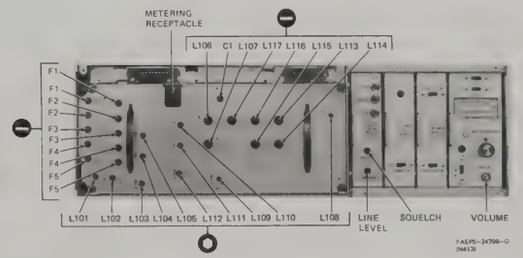
Where:

f_o = channel element frequency

f_c = carrier frequency

$$f_o = \frac{f_c - 45\ \text{MHz}}{48}$$

B. RECEIVER ADJUSTMENT LOCATIONS



C. MINIMUM RECEIVER METER READINGS

(NO INPUT SIGNAL APPLIED)

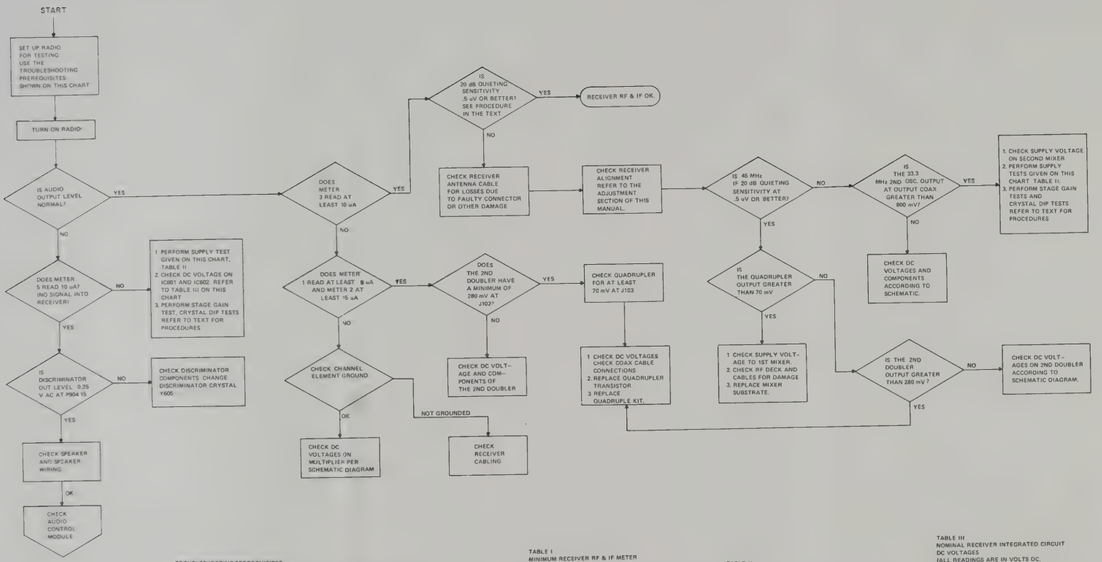
TEST SET SELECTOR SWITCH POSITION	READING (uA)	CIRCUIT METERED
1	10	Channel Element Output
2	15	First Doubler Output
3	10	Second Doubler Output
4+,4-	0 ±2	Discriminator Output
5	10	Second IF Amplifier and Limiter

D. RECEIVER ALIGNMENT

Step	Adjust	Meter Position	Stage and Procedure
1	L101, L102, L103, L104, L105		MULTIPLIER COILS - Adjust the cores of L101, L102, L103, and L105 to the end of the coil form flush with the printed circuit board. Adjust the core of L104 to the end of the coil form away from the printed circuit board.
2	L110, L111, L112		FIRST IF COILS - Adjust the cores of L110, L111, and L112 to the end of the coil form flush with the printed circuit board.
3	L106, L107, L113, L114, L115, L116, L117		PRESELECTOR AND INJECTION FILTER - Adjust the slugs at L106, L107, and L113 through L117 away from the rf deck until they stop. Adjust L106 four turns clockwise and L117 two turns clockwise.
4	L101, L102	1	CHANNEL ELEMENT OUTPUT - Adjust L102 two turns clockwise. Alternately turn L101 and L102 clockwise 1/2 turn at a time until a peak indication is achieved on meter 1.
5	L103, L104	2	FIRST DOUBLER - Tune L103 for a peak reading on meter 2. Tune L104 counterclockwise until meter 2 dips.
6	L104, L105	3	QUADRUPLER - Tune L105 clockwise until a peak reading is achieved on meter 3. Tune L104 until a peak reading is achieved on meter 3. Repeak L104 and L105 until no further improvement is obtained.
7	L108	4, 5	DISCRIMINATOR - Insert the center conductor of the output cable from a 11.7 MHz test oscillator into the L109 hole on the receiver shield. Do not contact the circuit board. Insert the conductor far enough to obtain a saturated reading on meter 5. By tuning L108, it should then be possible to obtain readings on either side of zero (center) on meter 4. Tune L108 for an EXACT zero (center) reading. This adjustment is critical.
8	L109	5	SECOND IF COIL - Insert the 11.7 MHz injection probe into the L112 hole in the receiver shield. Tune L109 for a peak reading on meter 5, keeping meter 5 out of saturation by moving the probe.
9	C1	4, 5	SECOND OSCILLATOR WARP CAPACITOR - Insert the 45 MHz injection probe into the L112 hole in the receiver shield. Tune C1 until quieting is obtained and meter 5 increases. Tune C1 for an EXACT zero reading on meter 4. This adjustment is critical.
10	L110, L111, L112	5	FIRST IF COILS - Insert the 45 MHz injection probe in the L110 hole on the receiver shield. Tune L112 clockwise for a peak reading on meter 5, keeping the meter out of saturation by moving the probe. Tune L111 clockwise for a peak reading on meter 5, keeping the meter out of saturation. Remove the probe and turn L110 ten turns clockwise.
11	L106	4, 5	INJECTION FILTER - Unsquelch the receiver and connect an rf signal generator to the antenna connector. Set the rf output level of the generator to maximum and set the generator to the carrier frequency. Tune L106 for peak reading on meter 5, reducing the generator level as necessary to keep meter 5 out of saturation.
12	L107, L105, L104	3, 5	Detune L105 until meter 3 drops to 10 uA. Tune L107 for a peak reading on meter 5. Tune L105 for a peak reading on meter 3. Repeak L104 and L105 until no further improvement is obtained.
13	L113, L114 L115, L116, L117	5	RF PRESELECTOR - Tune L117, L116, L113, L114 and L115 in that order for a peak reading on meter 5. Reduce the generator level as necessary to keep meter 5 out of saturation.

D. RECEIVER ALIGNMENT (Cont'd.)

Step	Adjust	Meter Position	Stage and Procedure
14	L113, L114, L115, L116, L117	5	Tune L113, L114, L115, L116, L117 in that order for best noise quieting.
15	L110, L111, L112, L109	5	FM modulate the carrier frequency with a 1 kHz tone at 7.5 kHz deviation. Peak L110, L111, L112, and L109 in that order for a maximum reading on meter 5.
16	F1	4	Adjust F1 channel element. Inject a known, accurate carrier frequency into the receiver. Adjust the channel element warp capacitor for a zero reading on meter position 4.
17	–	–	Perform 20 dB quieting sensitivity measurements to check alignment.


START
SET UP RADIO FOR TESTING USE THE TROUBLESHOOTING PREREQUISITES SHOWN ON THIS CHART
TURN ON RADIO*
IS AUDIO OUTPUT LEVEL NORMAL?
YES
NO
DOES METER S READ 10 uA? (NO SIGNAL INTO RECEIVER)
NO
1 PERFORM SUPPLY TEST GIVEN ON THIS CHART, TABLE II
2 CHECK DC VOLTAGE ON IC601 AND IC602 REFER TO TABLE III ON THIS CHART
3 PERFORM STAGE GAIN TEST, CRYSTAL DIP TESTS REFER TO TEXT FOR PROCEDURES
YES
IS DISCRIMINATOR OUT LEVEL 0.25 V AC AT P904-11
NO
CHECK DISCRIMINATOR COMPONENTS CHANGE DISCRIMINATOR CRYSTAL Y605
YES
CHECK SPEAKER AND SPEAKER WIRING
OK
CHECK AUDIO CONTROL MODULE
DOES METER S READ 10 uA?
YES
NO
IS 20 dB QUIETING SENSITIVITY .5 uV OR BETTER? SEE PROCEDURE IN THE TEXT
YES
RECEIVER RF & IF OK.
NO
CHECK RECEIVER ANTENNA CABLE FOR LOSSES DUE TO FAULTY CONNECTOR OR OTHER DAMAGE
CHECK RECEIVER ALIGNMENT REFER TO THE ADJUSTMENT SECTION OF THIS MANUAL.
IS 45 MHz IF 20 dB QUIETING SENSITIVITY AT .5 uV OR BETTER?
NO
IS THE 33.3 MHz 2ND OSC. OUTPUT AT OUTPUT COAX GREATER THAN 800 mV?
YES
1. CHECK SUPPLY VOLTAGE ON SECOND MIXER
2. PERFORM SUPPLY TESTS GIVEN ON THIS CHART TABLE II.
3. PERFORM STAGE GAIN TESTS AND CRYSTAL DIP TESTS REFER TO TEXT FOR PROCEDURES
NO
CHECK DC VOLTAGES AND COMPONENTS ACCORDING TO SCHEMATIC
YES
IS THE QUADRUPLER OUTPUT GREATER THAN 70 mV
NO
YES
1 CHECK SUPPLY VOLTAGE TO 1ST MIXER.
2 CHECK RF DECK AND CABLES FOR DAMAGE
3. REPLACE MIXER SUBSTRATE.
IS THE 2ND DOUBLER OUTPUT GREATER THAN 280 mV?
NO
CHECK DC VOLTAGES ACCORDING TO SCHEMATIC DIAGRAM.
YES
DOES METER S READ AT LEAST 8 uA AND METER Z AT LEAST 15 uA
YES
NO
DOES THE 2ND DOUBLER HAVE A MINIMUM OF 280 mV AT J103?
YES
NO
CHECK QUADRUPLER FOR AT LEAST 70 mV AT J103
1 CHECK DC VOLTAGES CHECK COAX CABLE CONNECTIONS
2. REPLACE QUADRUPLER TRANSISTOR
3 REPLACE QUADRUPLE KIT.
CHECK DC VOLTAGE AND COMPONENTS OF THE 2ND DOUBLER
DOES METER S READ AT LEAST 8 uA AND METER Z AT LEAST 15 uA
YES
NO
CHECK CHANNEL ELEMENT GROUND
OK
CHECK DC VOLTAGES ON MULTIPLIER PER SCHEMATIC DIAGRAM
NOT GROUNDED
CHECK RECEIVER CABLING

TROUBLESHOOTING PREREQUISITES

1. THE RECEIVER RF & IF BOARD MUST BE INSTALLED IN A COMPLETE RECEIVER FOR TESTING. BE SURE ALL CIRCUIT BOARD MOUNTING SCREWS ARE SECURE, SHIELDS INSTALLED, AND THAT ALL CONNECTIONS TO THE BOARD ARE PROPERLY MADE
2. USING A TEK.-27 ADAPTER CABLE, CONNECT A MOTOROLA PORTABLE TEST SET OR METER PANEL TO THE RADIO AS FOLLOWS:
   - A. CONNECT THE ADAPTER CABLE 20-PIN CONNECTOR TO THE RECEPTACLE ON THE FRONT OF THE TEST SET OR METER PANEL.
   - B. CONNECT THE WHITE "METERING" PLUG TO THE METERING RECEPTACLE ON THE RECEIVER RF AND IF BOARD
3. SET PORTABLE TEST SET SWITCHES AS FOLLOWS
   - A. FUNCTION SWITCH TO THE RCVR POSITION
   - B. METER REVERSING SWITCH TO OFF POSITION
   - C. ADAPTER CABLE SENS SWITCH TO THE 100 mV POSITION IF THE ADAPTER CABLE HAS NO SENS SWITCH, THE UNIT OPERATES AT 100 mV ALL OF THE TIME
   - D. ADAPTER CABLE REFERENCE SWITCH TO POSITION A OR B.
   - E. D. SELECTOR SWITCH AS REQUIRED BY THE TROUBLESHOOTING PROCEDURE
4. ON "PRIVATE-LINE" RADIOS, DISABLE THE PL MODULE
5. SET THE SQUELCH CONTROL FULLY COUNTERCLOCKWISE (UNSQUELCHED)
6. SET THE VOLUME CONTROL FOR A COMFORTABLE LISTENING LEVEL
7. HIGH RF FREQUENCY MEASUREMENTS SHOULD BE MADE WITH AN ACCURATE METER SUCH AS THE MOTOROLA S1339A (SEE EQUIPMENT LIST).

TABLE I
MINIMUM RECEIVER RF & IF METER READINGS TABLE
(NO INPUT SIGNAL APPLIED)

SELECTOR SWITCH POSITION	READING (MICRO-AMPS)	CIRCUIT METERED
1	8	CHANNEL ELEMENT OUTPUT
2	15	FIRST DOUBLER OUTPUT
3	10	SECOND DOUBLER OUTPUT
4	0 ± 2	DISCRIMINATOR OUTPUT
5	10	SECOND I-F AMPLIFIER AND LIMITER

TABLE II
RECEIVER RF & IF DC INPUT VOLTAGES

TEST POINT	DESCRIPTION
P904- 9	B+ CONTINUOUS (+13.8 V DC WITH REFERENCE TO CHASSIS)
P904-11	9.6 V DC CONTINUOUS (WITH REFERENCE TO CHASSIS) (±0.5 V)
P904-8,6	9.6 V DC CONTINUOUS (WITH REFERENCE TO CHASSIS) (±0.5 V)

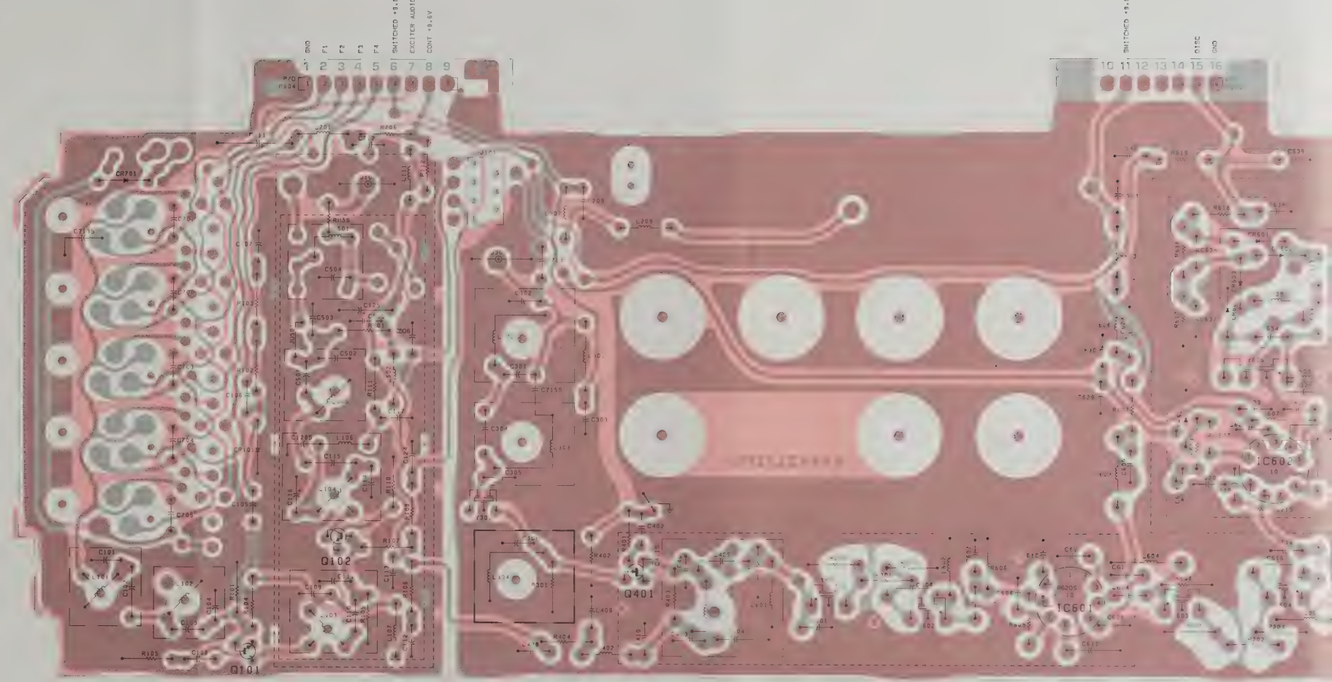
TABLE III
NOMINAL RECEIVER INTEGRATED CIRCUIT DC VOLTAGES
(ALL READINGS ARE IN VOLTS DC, MEASURED WITH RESPECT TO CHASSIS)

PIN NO	U601 VOLTAGE	U602 VOLTAGE
1	GND	2.8
2	GND	GND
3	2.8	2.8
4	6.6	6.6
5	9.3	9.3
6	7.2	7.2
7	6.4	6.4
8	2.8	2.8
9	2.8	2.8
10	GND	GND

NOTE: ALL VOLTAGES MAY VARY +10% FROM NOMINAL READINGS SHOWN

DEPS-21078-E

RF & I-F Board
Schematic Diagram, Circuit Board Detail, and Troubleshooting Chart
Motorola No. PEPS-24797-B
(Sheet 1 of 2)
7/15/81- UP



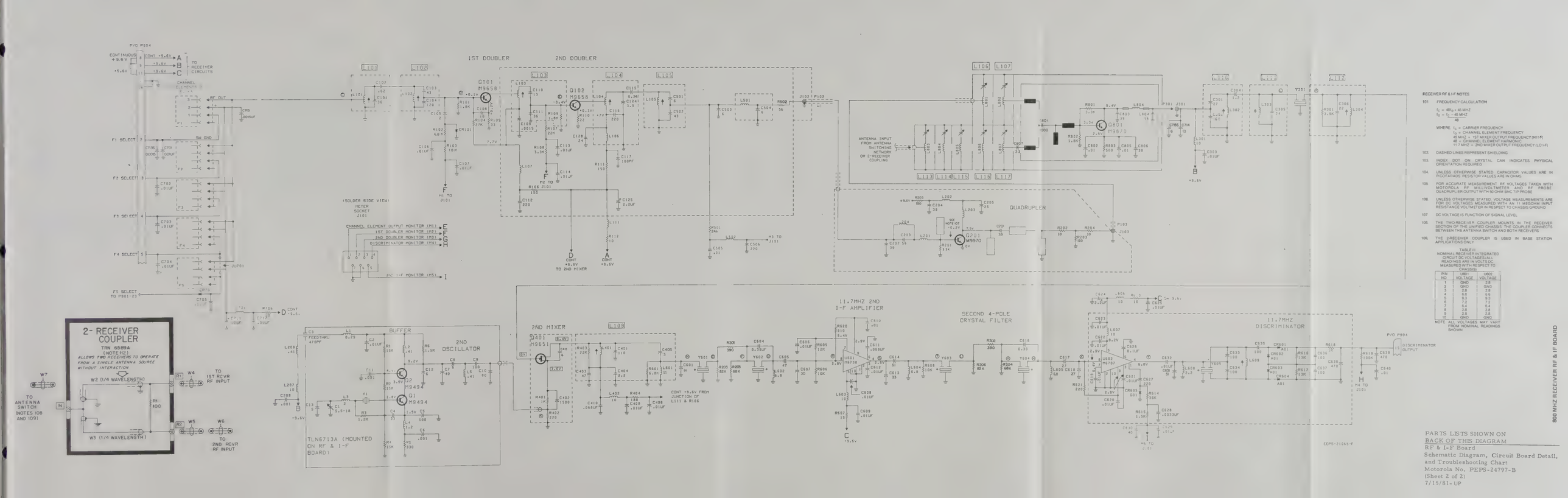
SHOWN FROM SOLDER SIDE

TRANSISTOR LEAD DETAILS (BOTTOM VIEW)

Q101, 102 — B E C
Q401 — B E C

— — — SHIELD ON COMPONENT SIDE
— · — · — SHIELD ON SOLDER SIDE
PARTS ENDING IN '5' ARE ON SOLDER SIDE
* INDICATES CRYSTAL POLARITY

COMPONENT SIDE 80-EEPS-24370-O
SOLDER SIDE 80-EEPS-24371-O
O-EEPS-24372-O



RECEIVER RF & I-F NOTES

101 FREQUENCY CALCULATION

$f_O = 48f_E + 45$ MHZ

$f_O = f_E - \frac{45 \text{ MHZ}}{48}$

WHERE f_O = CARRIER FREQUENCY
f_E = CHANNEL ELEMENT FREQUENCY
45 MHZ + 1ST MIXER OUTPUT FREQUENCY (M1-F)
48 = CHANNEL ELEMENT HARMONIC
11.7 MHZ = 2ND MIXER OUTPUT FREQUENCY (LO-I-F)

102. DASHED LINES REPRESENT SHIELDING

103. INDEX DOT ON CRYSTAL CAN INDICATES PHYSICAL ORIENTATION REQUIRED

104. UNLESS OTHERWISE STATED CAPACITOR VALUES ARE IN PICOFARADS RESISTOR VALUES ARE IN OHMS

105. FOR ACCURATE MEASUREMENT RF VOLTAGES TAKEN WITH MOTOROLA RF MILLIVOLTMETER AND RF PROBE QUADRUPLER OUTPUT WITH 50 OHM BNC TIP PROBE

106. UNLESS OTHERWISE STATED VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH AN 11 MEGOHM INPUT RESISTANCE VOLTMETER IN RESPECT TO CHASSIS GROUND

107. DC VOLTAGE IS FUNCTION OF SIGNAL LEVEL

108. THE TWO RECEIVER COUPLER MOUNTS IN THE RECEIVER SECTION OF THE UNIFIED CHASSIS. THE COUPLER CONNECTS BETWEEN THE ANTENNA SWITCH AND BOTH RECEIVERS

108L THE 2 RECEIVER COUPLER IS USED IN BASE STATION APPLICATIONS ONLY.

TABLE H
NOMINAL RECEIVER INTEGRATED CIRCUIT DC VOLTAGES ALL READINGS ARE IN VOLTS DC MEASURED WITH RESPECT TO CHASSIS GND

PIN NO	U601 VOLTAGE	U602 VOLTAGE
1	GND	2.8
2	GND	GND
3	2.8	2.8
4	6.0	6.0
5	6.0	6.0
6	7.2	7.2
7	6.4	6.4
8	2.8	2.8
9	2.8	2.8
10	GND	GND

NOTE ALL VOLTAGES MAY VARY FROM NOMINAL READINGS SHOWN

PARTS LISTS SHOWN ON BACK OF THIS DIAGRAM

RF & I-F Board
Schematic Diagram, Circuit Board Detail, and Troubleshooting Chart
Motorola No. PEPS-24797-B
(Sheet 2 of 2)
7/15/81-UP

800 MHZ RECEIVER RF & IF BOARD

PARTS LIST

TRF6031C Receiver RF and IF Board PL-5637-C

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		CAPACITOR: fixed pF ±5%; 500 V: unless otherwise stated
C101	21-82355B63	3n
C102	21-82450B46	0.62
C103	21-82355B64	43
C104	21-8251QC09	120; 200 V
C105	21-85733n	2 n, 2
C106, 107	21-82426B59	.01 uF +80-20%, 200 V
C108	21-82359B26	10 n, 2%
C109, C713	21-82187B11	.0015 uF ±10%; 100 V
C110	21-8261QC74	13
C111	21-82133G39	3n
C112	21-82187B08	220 ±10%
C113, 114	21-82426B59	.01 uF +80-20%, 200 V
C115	21-867162	0.24 ±%
C116	21-82187B08	220 ±10%
C117	21-831125	100 ±10%; 300 V
C124	21-82133G40	3.9 -, 25%
C125	21-8476Z08	2.2 uF ±20%
C128	21-8403n5	24
C209	21-82187B20	1000 ±10%, 100 V
C301	21-8260QD37	27
C302	21-84534B05	360
C303	21-82426B59	.01 uF +80-20%, 200 V
C304	21-82450B10	1.2
C305	21-82133G46	24
C306	21-82133G62	22
C401	21-8261QC49	130, 200 V
C402	21-82187B31	1500 ±10%; 200 V
C403	21-8261QC03	47; 200 V
C404	21-8476Z08	2.2 uF ±20%; 25 V
C405	21-82450B11	3 -5%, 500 V
C406, 409	21-82426B19	.01 uF +80-20%; 200 V
C410	8-82505G4	.068 uF ±10%, 50 V
C411	21-840848	6 -5%
T15		
C502	21-8493Z1	43
C503, C504	21-840848	6
C505	21-82426B59	.01
C506	21-82187B08	220
C601		11 -5%, NP0
C604	21-82450B07	0.39
C605	21-8340QD44	47 -5%, N080
C606	21-82426B59	.01 uF +80-20% 200 V
C607	21-8261QC14	30 -5%, N150
C608	21-82426B59	.01 uF +80-20% 200 V
	21-82426B59	.01 uF +80-20%, 200 V
C611	8-83831H05	.068 uF ±10%, 100 V
C612	21-82426B59	.01 uF ±10%; 200 V
C613	21-82355B09	33 -5%; NP0
C614	21-8261QC29	51 -5%, N150
C616	21-82450B03	0, 10
C617, 618	21-8340QD37	27 -5%, N150
	21-82426B39	.01 uF +80-20%, 200 V
621, 622, 623		
C624	21-84762H04	2.2 uF ±20%, 25 V
C625	21-82426B59	.01 uF +80-20%, 200 V
C626	21-83833H56	.18 uF ±10%; 100 V
C627	21-82187B08	220
C628	21-82426B57	.0033 uF ±10%; 200 V
C629	21-82426B59	.01 uF +80-20%, 200 V
C630	21-84693B24	40
C631	21-8261QC07	30, 200 V
C632		.01 uF +100-20%, 75 V
C633, 634, 635, 636, 637	21-83798B01	100; 200 V
C638, 639		470 ±10%
C640	21-82428B56	.01 uF +80-20%, 200 V
C701 thru 705	21-82428B59	.01 uF +80-20%, 200 V
C711	21-84762H03	10 uF ±10%; 20 V
C712	21-82426B59	.01 uF +80-20%, 200 V
C714	21-90865054	13 -5%; N330
CR101	48-82139G01	DIODES: (SEE NOTE) germanium
CR601 thru 604	48-84616A01	hot carrier
CR605	48-82139G01	germanium
CR701	48-82392B03	silicon

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
J101	9-84207B01	CONNECTOR, receptacle: female; 7 contact
J102, J301	9-84231B02	female; single contact
L101	24-84972A15	COIL, RF: 8-1/2 turns; (BRN)
L102	24-84972A16	6-1/2 turns; (RED)
L103	24-84972A12	8-1/2 turns; (ORG)
L104	24-83857C07	12 turns; (multiplier)
L105	24-83857C05	14-1/4 turns; (multiplier)
L106	24-83961B01	3 turns; (BRN)
L107, L111, L114	24-83961B01	3 turns; (BRN)
L302		
L207	24-82723H07	choke; 10 uH
L209	24-82723H05	choke; 0.41 uH; (YEL)
L301	24-82723H07	choke; 10 uH
L302 thru 304	24-84113B01	7-1/2 turns; (BRN)
L401	24-84258B05	green
L402	24-82723H07	choke, 10 uH
L601	24-82549D25	choke, 10 uH
L602	24-84250D02	choke, 6, 8 uH
L603	24-82723H07	choke, 10 uH
L604, 605	24-84250D02	choke, 6, 8 uH
L606, 607	24-82723H07	choke, 10 uH
L608	24-84250D03	choke, 2, 2 uH
L609	24-83879G06	20 turns (YEL)
L701	24-83961B01	3 turns; (BRN)
L501	24-83884G01	choke; molded
Q101, 102	48-84696B	TRANSISTOR: (SEE NOTE) NPN; M9658
Q401	48-8496S1	field-effect
		RESISTOR, fixed; ±10%; 1/4 W; unless otherwise stated
R101	6-124C55	1.8k
R102	6-124A69	6, 8k -5%; 1/4 W
R103	6-124A51	1, 8k -5%; 1/4 W
R104	6-124C81	27k
R105	6-124A33	33 ±5%
R106	6-124C59	150
R107	6-124C81	22k
R108	6-124C61	3, 3k
R109	6-124C55	1, 8k
R110	6-124A09	22 ±5%
R111	6-124C29	150
R112	6-124C01	10
R113	6-185B64	56 ±10%; 1/8 W
R201, 202	6-124A39	390
R203, 204	6-124A93	68k
R205, 206	6-124A95	82k
R301	6-124A63	3, 9k
R401	6-124C49	1k
R402	6-124A32	220 ±5%
R403	6-124A81	22k ±5%
R404	6-124C31	180
R501	6-124C87	39k
R502	6-185B61	56; 1/8 W
R601	6-124A69	6, 8k ±5%
R605	6-124A71	12k ±5%
R606	6-124A73	20k ±5%
R607	6-124C05	15
R608	6-124A77	10k ±5%
R613	6-124C01	10
R614	6-124A81	36k ±5%
R615	6-124C53	1.5k
R616, 617	6-124A75	13k
R618	6-124C49	1k
R619	6-124A97	100k
R620	6-124A69	910 ±5%
R621	6-124A33	220 ±5%
R706	6-124C01	10
U601	51-84267A38	INTEGRATED CIRCUIT: (SEE NOTE) type M6738
U602	51-84267A07	type M6707
Y602 thru 604	48-84755E07	CRYSTAL: (SEE NOTE) 11.7 MHz
Y605	48-84754E01	11.7 MHz (discriminator)
Y301	48-84577K01	45.0 MHz
Y601	48-84755E08	11.7 MHz

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		NON-REFERENCED ITEMS
	3-134212	SCREW; 4-40 x 5/16"; 10 req'd.
	3-138162	SCREW; tapping; 4-40 x 3/8": 8 req'd.
	3-138891	SCREW; tapping; 6-32 x 7/16"; 6 req'd.
	4-49854	Washer, spacer; 2 req'd.
	29-855943	PIN, terminal, plated; 20 req'd.
	29-10134A29	LUG, terminal
	29-84028H01	TERMINAL, male; 16 req'd.
	43-868T00	BUSHING, threaded; 8 req'd.
	55-84300B02	HANDLE; 2, 12"
	55-84300B03	HANDLE; 1, 83"

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN6713A 2nd Oscillator Kit PL-4217-O

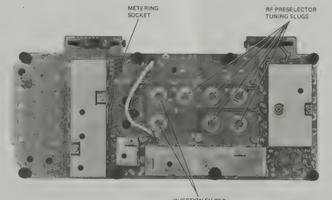
REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
C1	20-82399D04	CAPACITOR, fixed: variable; 5.5-18 pF
C2	21-82428B59	.01 uF +80-20%, 200 V
C3	21-821474	470 pF ±20%; 500 V
C4	21-823559D9	33 pF ±5%, 500 V
C5	21-831125	100 pF ±10%; 300 V
C6	21-82187B14	.001 uF ±10%; 100 V
C7	21-84395D1	40 pF ±5%; 500 V
C8	21-840848	6 pF +0.5 pF ; 500 V
C9	21-8261QC44	100 pF ±10%; 100 V
C10	21-82880E33	80 pF ±5%, 500 V
C11	21-82187B14	.001 uF ±10%; 100 V
C12	21-840848	6 pF +0.5 pF; 500 V
C13	21-82204B22	5 pF ±5%; 250 V
L1	24-82723H04	COIL, RF: choke, 0.29 uH
L2	24-82723H05	choke, 0.41 uH
L3	24-890687	choke, 2.0 uH
L4	24-82723H01	choke, 1.2 uH
L5	24-82723H05	choke, 0.41 uH
Q1, 2	48-869494	TRANSISTOR: (SEE NOTE) NPN: type M9494
R1, 2	6-124C77	RESISTOR, fixed: 15K ±10%; 1/4 W
R3	6-124C51	1.2K ±10%; 1/4 W
R4	6-124C77	15K ±10%; 1/4 W
R5	6-124A37	330 ±5%; 1/4 W
R6	6-124A53	1.5K ±5%; 1/4 W
Y1	48 83860F09	CRYSTAL: 33.3 MHz
		MECHANICAL PARTS
	3-139012	SCREW, 4-40 x 1/4"
	4-47426	WASHER, 2 req'd.
	15-82304L01	COVER
	43-83066F05	BUSHING, .250" length; 2 req'd.
	43-83066F06	BUSHING, .170" length.
	43-83617D01	BUSHING, round
	14-84602K02	INSULATOR, crystal; 2 req'd.
	26-82303L01	SHIELD
	43-82555L01	SPACER, threaded (oscillator shield)

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part number.

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		TRN6673A 2 Receiver Hardware Kit PL-4433-O
	2-101A53	NUT, spring
	2-82360B07	NUT, speed
	3-133038	SCREW, tapping; #14-14 x 3/4"
	26-83820K01	SHIELD and INSERT, receiver
	26-84043E01	SHIELD, pc board
	26-84981F01	SHIELD, receiver
	46-84090C01	STUD, retainer
	55-84300B01	HANDLE

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		TRF6021A RF Deck PL-5638-O
C801	21-84547A01	CAPACITOR, fixed: 1000 -20% 50 V
C802	21-84547A05	10000 pF ±20%; 50 V
C803	21-84736E12	39 pF ±5%; 500 V
C804	21-84873H17	56 pF ±10%; 50 V
C805	21-84547A05	10000 pF ±20%; 50 V
C806	21-84736E12	39 pF ±5%; 500 V
C807	21-84736E27	3, 3 pF -.25%
J102	8-82547L02	CONNECTOR, receptacle: FEMALE, single contact
L801 thru 807	1D83010K03	COIL, RF: RESONATOR and LEAD ASSY.
L808	76-83960B01	FERRITE BEAD
L809	24-82723H05	choke; 0.41 uH
L810	26-83960B01	FERRITE BEAD
P301	28-84282D01	CONNECTOR, plug: male; single contact
P102	28-87317C01	male, single contact
Q801	48-869870	TRANSISTOR: (SEE NOTE) NPN; M9870
R801, 802, 803		Cannot be replaced
		MECHANICAL PARTS
	3-134268	SCREW, tapping: 4-40 x 7/16" 4 req'd.
	15-84630E01	COVER, connector (J801)
	42-83032K01	HOLDER; 2 req'd.
	64-83038K02	PLATE, cover
	29-5227	LUG, soldering #6; 2 req'd.
	15-83034K01	HOUSING, rf deck
	2-84773E03	NUT, tension; 7 req'd.
	3-84997K01	SLUG TUNING; 7 req'd.
	32-82101L02	GASKET
	3-136138	SCREW, tapping: 6-32 x 3/8": 11 req'd.

NOTE:
For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.

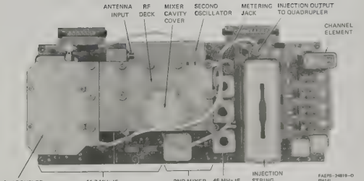


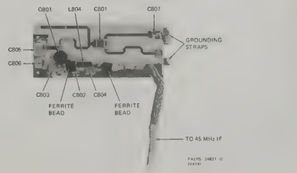
REVISIONS 68P81037E04-C

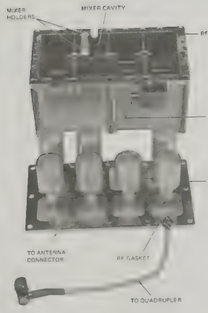
CHASSIS & SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLF6011C	C115	FROM 21-82450B35, 0.2 pF ±10% TO 21-867162, 0.24 pF ±1%	2ND DOUBLER

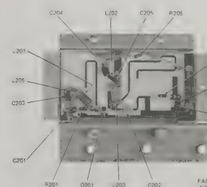
REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		TLF6163A Quadrupler PL-5639-.
C201	21-84736E12	CAPACITORS fixed, pF, ±5% 50 V: unless otherwise stated 39
C202	21-84736E12	39
C203	21-84873H17	56, ±10%
C204	21-84736E12	39
C205	21-84736E10	25
L201	24-83884G04	COILS: 6-1/2 turns: (yellow)
L202	24-82723H04	choke; 290 uH
L203	24-83884G01	3-1/2 turns (pink)
L205	24-82723H04	choke; 290 uH
Q201	48-869970	TRANSISTORS: (SEE NOTE) NPN: type M9970
R201	6-185A61	RESISTORS: fixed, 10%, 1/8 W 3, 3k ±5%
R202	6-185B55	10
R203	6-185B68	120
R204	6-185B55	10
R205	6-185A29	150 ±5%
		NON-REFERENCED ITEMS
	1-80791B63	CABLE, quadrupler includes
	29-5227	LUG, solder; 2 req'd.
	28-84282D01	CONNECTOR, phono
	30-83794C01	CABLE
	1-80791B64	CHASSIS includes
	3-134169	SCREW; 4-40 x 1/4; 6 req'd.
	10-83170D01	RING, solder
	64-82576L01	COVER
	15-82575L01	CHASSIS
	9J-87511C01	RFI FILTER FEEDTHRU
	9-82547L02	RECEPTACLE, mini, coaxial
	39-10184A24	CONTACT, bubble-pin; chain-form

NOTE:
For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.









DESCRIPTION, INSTALLATION, AND MAINTENANCE

DESCRIPTION 68P81026E21
INSTALLATION 68P81026E22
MAINTENANCE 68P81026E23

RECEIVER HOUSING

RECEIVER HOUSING ASSEMBLY AND SHIELD KIT 68P81039E17

MODULES

AUDIO CONTROL 68P81036E23
TONE "PRIVATE-LINE" DECODER 68P81026E26
"DIGITAL PRIVATE-LINE" DECODER 68P81026E27
"SPECTRA TAC" ENCODER 68P81036E36
RECEIVER QUALITY SIGNAL 68P81041E18
RECEIVER QUALITY SIGNAL LINE CURRENT GENERATOR 68P81041E17
VOTING ENCODER 68P81026E29
RECEIVER SERVICE MODULE 68P81026E31

RECEIVER RF & I-F

MICOR SENSITRON LOW-BAND RECEIVER 68P81026E34
MICOR SENSITRON MID-BAND RECEIVER 68P81026E36
MICOR SENSITRON HIGH BAND RECEIVER 68P81026E37
MICOR SENSITRON UHF RECEIVER 68P81026E38
MICOR SENSITRON 800 MHz RECEIVER 68P81037E04

POWER SUPPLY

POWER SUPPLY & EMERGENCY POWER KIT 68P81035E44

POWER SUPPLY

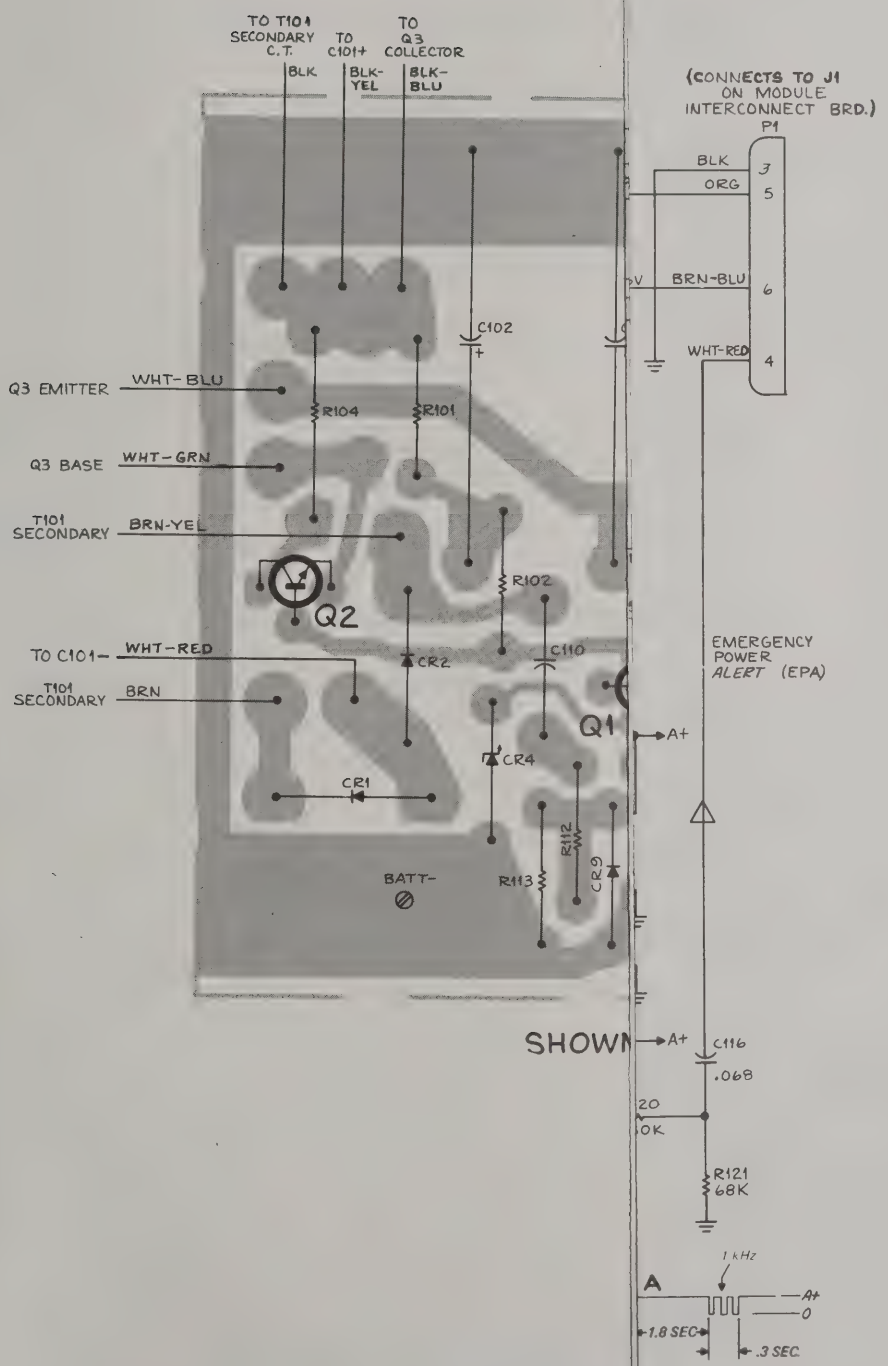
MODEL TPN1158A

& EMERGENCY POWER KIT

MODEL TPN1141A

FUNCTION

TPN1158A provides dc operating voltages for "Spectra TAC", receivers. TPN1141A provides emergency battery operation in case of ac power failure.



NOTES:

1. UNLESS OTHERWISE NOTED; RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS.
2. CHASSIS MOUNTED COMPONENT.

LEGEND

= THEORY OF OPERATION DATA

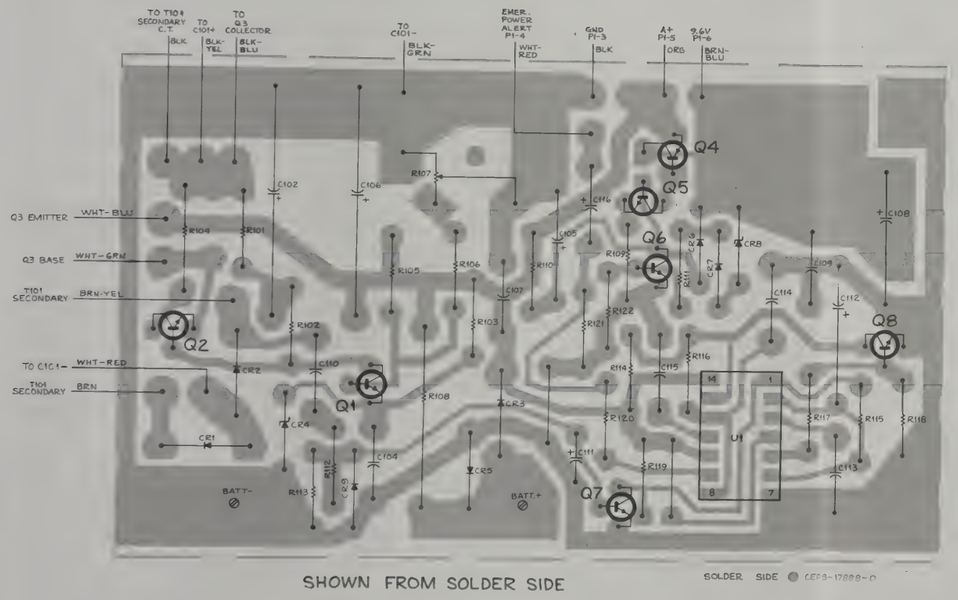
= MAINTENANCE DATA

= SIGNAL FLOW

POWER SUPPLY
MODEL TPN1158A
& EMERGENCY POWER KIT
MODEL TPN1141A

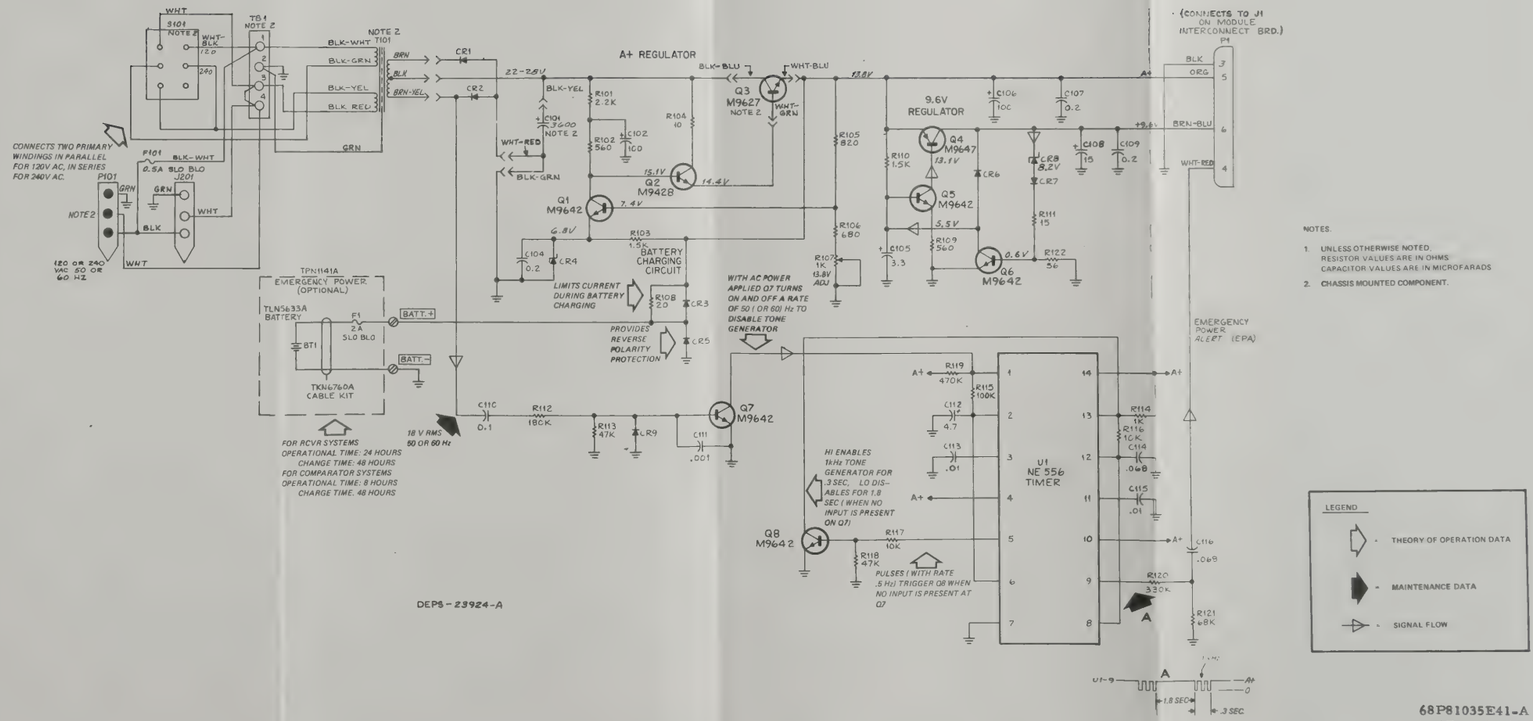
FUNCTION

TPN1158A provides dc operating voltages for "Spectra TAC", receivers. TPN1141A provides emergency battery operation in case of ac power failure.



SHOWN FROM SOLDER SIDE

SOLDER SIDE DEPS-17888-0


CONNECTS TWO PRIMARY WINDINGS IN PARALLEL FOR 120V AC, IN SERIES FOR 240V AC.
120 OR 240 VAC 50 OR 60 HZ
A+ REGULATOR
9.6V REGULATOR
BATTERY CHARGING CIRCUIT
TPN1141A EMERGENCY POWER (OPTIONAL)
TLN5633A BATTERY
TKN6760A CABLE KIT
LIMITS CURRENT DURING BATTERY CHARGING
PROVIDES REVERSE POLARITY PROTECTION
WITH AC POWER APPLIED QT TURNS ON AND OFF A RATE OF 50 (OR 60) Hz TO DISABLE TONE GENERATOR
18 V RMS 50 OR 60 Hz
HI ENABLES 1kHz TONE GENERATOR FOR 3 SEC, LO DISABLES FOR 1.8 SEC (WHEN NO INPUT IS PRESENT ON Q7)
PULSES I WITH RATE .5 Hz) TRIGGER Q8 WHEN NO INPUT IS PRESENT AT Q7
U1 NE 556 TIMER
FOR RCVR SYSTEMS OPERATIONAL TIME: 24 HOURS CHANGE TIME: 48 HOURS FOR COMPARATOR SYSTEMS OPERATIONAL TIME: 8 HOURS CHARGE TIME: 48 HOURS
(CONNECTS TO J1 ON MODULE INTERCONNECT BRD.)
EMERGENCY POWER ALERT (EPA)
1.8 SEC
3 SEC

DEPS-23924-A

NOTES:

1. UNLESS OTHERWISE NOTED: RESISTOR VALUES ARE IN OHMS CAPACITOR VALUES ARE IN MICROFARADS
2. CHASSIS MOUNTED COMPONENT.

LEGEND
- THEORY OF OPERATION DATA
- MAINTENANCE DATA
- SIGNAL FLOW

68P81035E41-A
(Sheet 1 of 2)
6/12/81- UP

MOTOROLA

USER QUESTIONNAIRE

To the User of This Instruction Manual:

Motorola is engaged in a continuous program of improving its instruction literature. We believe that you can aid us in this program, so that we in turn can better help you service our equipment. To foster these aims, would you please answer the following questions:

SCHEMATIC DIAGRAMS AND CABLING DIAGRAMS

1. ☐ Are accurate and easy to follow
2. ☐ Contain minor errors
3. ☐ Contain major errors
4. ☐ Are difficult to follow

If you have checked any box except 1, please tell us what schematic diagrams, or portions thereof, were at fault, or enter other comments.*

_____

_____

TEXT

1. ☐ Easy to follow — helps to service equipment
2. ☐ Would like more information on*

_____

_____

3. ☐ Some instruction sections are too long or superfluous such as*

_____

_____

4. ☐ Other comments*

_____

_____

_____

(continued on reverse side)

TAPE & MAIL
NOTICE: Postal Regulations Prohibit Staples. Please use tape.

68P85901D80-L

7/12/79

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6297A Power Supply Board — PL-3469-A

		CAPACITOR, fixed ; uF: unless otherwise stated
C102, 106	23-82077C01	100 +150-10%; 35 V
C104, 107, 109	21-82372C05	0.2 +80-20%; 25 V
C105	23-83214C17	3.3 ±20%: 15 V
C108	23-83214C02	15 ±20%; 25 V
C110	8-82905G22	0.1 ±10%; 100 V
C111	21-82187B29	.001 ±10%; 100 V
C112	23-83214C15	4.7 ±20%; 25 V
C113, 115	8-82905G01	.01 ±10%; 50 V
C114, 116	8-82905G04	.068 ±10%; 50 V
		DIODE:(SEE NOTE)
CR1, 2, 3	48-82525G14	silicon
CR4	48-82256C02	Zener; type; 6.8 V
CR5	48-82466H13	silicon
CR6, 7, 9	48-83654H01	silicon
CR8	48-82256C16	Zener; type; 8.2 V
		TRANSISTOR: (SEE NOTE)
Q1, 5 thru 8	48-869642	NPN; type M9642
Q2	48-869428	NPN; type M9428
Q4	48-869647	PNP; type M9647
		RESISTOR, fixed: ±10%; 1/4 W unless otherwise stated
R101	6-124C57	2.2k
R102, 109	6-124C43	560
R103, 110	6-124C53	1.5k
R104	6-125C01	10; 1/2 W
R105	6-124C47	820
R106	6-124C45	680
R107	18-83168C03	var; 1k
R108	17-82177B07	20 ±5%; 5 W
R111	6-124A05	15 ±5%
R112	6-124D04	180k
R113, 118	6-124C89	47k
R114	6-124C49	1k
R115	6-124C97	100k
R116, 117	6-124C73	10k
R119	6-124D14	470k
R120	6-124D10	330k
R121	6-124C93	68k
R122	6-124A19	56 ±5%
		INTEGRATED CIRCUIT: (SEE NOTE)
U101	51-84320A85	type NE556
NON-REFERENCED ITEM		
	29-83362G01	TERMINAL; 2 req'd.

NOTE:
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

TKN6757A Cable Kit — PL-3471-O

P1		CONNECTOR, plug: Consists of 14-84590B01 INSULATOR, housing and 9-84151B05 RECEPTACLE, contacts; 4 req'd.
NON-REFERENCED ITEM		
	42-10217A02	STRAP, cable; 3 req'd.

TPN6106A Chassis and Hardware Kit — PL-5528-O

C101	23-83093G23	CAPACITOR, fixed: 3600 uF +150-10%; 35 V
F101	65-475395	FUSE: 1/2 amp; 125 V Slow Blow Type
Q3	48-869627	TRANSISTOR: (SEE NOTE) NPN; type M9627
S101	40-84241G03	SWITCH: 2 position; slide
T101	25-83043L01	TRANSFORMER: pri: #1 BLK-WHT, BLK-GRN; res. 29 ohms pri: #2 BLK-YEL, BLK-RED; res. 32 ohms sec: BRN, BRN-YEL W/BLK center top; res. 1 ohm
TB1	31-121702	TERMINAL STRIP: 4 contact
P201	09-83175L01	PLUG: 3 pin, female
P101	28-83176L01	3 pin, male
NON-REFERENCED ITEMS		
	7-83181L01	BRACKET, fuseholder
	9-82083C03	RECEPTACLE, fuse
	14-865854	INSULATOR, transistor
	37-12706	GROMMET, rubber; 2 req'd.
	42-861179	CLAMP, cable
	42-10217A02	STRAP, cable; 6 req'd.
	42-83123F01	RETAINER; 6 req'd.
	9-82673A01	SOCKET, transistor
	30-84110A01	CABLE, 3 conductor
	29-84151L01	PIN, female
	29-84150L01	PIN, male

NOTE:
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TKN6760A Battery Cable — PL-3472-

F1	65-804908	FUSE: 2 amp; 32 V; slow-blow type
NON-REFERENCED ITEMS		
	41-82885A01	SPRING, fuse
	14-82882A01	INSULATOR, fuseholder
	14-82883A01	INSULATOR, fuseholder cap
	29-84078B01	LUG, spade; 2 req'd.
	42-82884A01	CLIP, fuse; 2 req'd.
	39-10061A32	CONTACT, male (small)
	39-10061A23	CONTACT, male (large)

TLN5633A Battery — PL-3473-A

BT1	60-84346F02	BATTERY (gelsel)
NON-REFERENCED ITEM		
	54-84463F01	LABEL, battery

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USER QUESTIONNAIRE

To the User of This Instruction Manual:

Motorola is engaged in a continuous program of improving its instruction literature. We believe that you can aid us in this program, so that we in turn can better help you service our equipment. To foster these aims, would you please answer the following questions:

SCHEMATIC DIAGRAMS AND CABLING DIAGRAMS

1. ☐ Are accurate and easy to follow
2. ☐ Contain minor errors
3. ☐ Contain major errors
4. ☐ Are difficult to follow

If you have checked any box except 1, please tell us what schematic diagrams, or portions thereof, were at fault, or enter other comments.*

_____

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TEXT

1. ☐ Easy to follow — helps to service equipment
2. ☐ Would like more information on*

_____

_____

3. ☐ Some instruction sections are too long or superfluous such as*

_____

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4. ☐ Other comments*

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3. ☐ Some are superfluous such as*

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AVAILABLE BACKGROUND REFERENCE PUBLICATIONS

Seven reference publications are available to provide background information needed to service some of the newer Motorola products more effectively. The information in these publications is not duplicated in our instruction manuals. To obtain your free copy, check the ones you want and return this self-mailer to us.

Check item desired:

☐ **Basic Logic Circuit Guide** 68P81105E88
Describes the basic logic circuits used in Motorola Communications digital equipment and the logic notational scheme used in our instruction manuals.

☐ **"Digital Private-Line" Binary-Coded Squelch** 68P81106E83
Contains fundamentals of "Digital Private-Line" system operation, circuit operation and servicing techniques.

☐ **Safe Handling of CMOS Integrated Circuit Devices** 68P81106E84
Describes special handling techniques needed to prevent irrepairable damage from static charges encountered with normal handling of CMOS devices.

☐ **Reducing Noise Interference in Mobile Two-Way Radio Installations** 68P81109E33
Defines the major sources of noise encountered in a mobile radio installation and suggests methods of remedying them.

☐ **Anti-Skid Braking Precautions** 68P81109E34
Provides installation suggestions and a detailed checkout procedure for installation of mobile radios in vehicles with anti-skid braking systems.

☐ **Removal and Replacement of Chip Components on Circuit Boards** 68P81113E77
Contains general information and repair procedures relative to chip-type (leadless) components.

☐ **Lightning Protection Recommendations** 68P81111E17
Provides general information concerning lightning protection for equipment sites. Also, provides a quick reference of available lightning protection kits.

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